THE LOCATION PATTERN OF MALLS IN TEXAS

A Thesis

by

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MASTER OF URBAN PLANNING

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ABSTRACT

Malls are common places in urban areas. They present us with safe and convenient environments to shop and to spend leisure time. Although malls have an important presence in our lives, not much empirical research on malls exists in the field of urban studies, especially on the spatial and locational distribution of malls.

This research deals with the locational pattern of malls in Texas. I analyzed locations of malls in the larger context of the built and human environment. Specifically, the locations of eighty-one malls in four major metropolitan areas in Texas were studied in light of how highway networks, land availability, population density and household income affect mall locations, using a time-series methodology from 1970 to 2010.

The results of this analysis show that the spatial distributions of the malls were primarily correlated with the existence of highway networks. The land availability was an essential but not a decisive factor for mall location. Moreover, household income was a more important factor than population density regarding mall's site selection. These results indicate that existing urban settings and conditions influence mall locations, but malls are not equally accessible to everyone, especially to low-income households. This equity problem should be addressed in future research.

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CHAPTER I

INTRODUCTION

1.1. Objective of the study

People cannot live without goods and malls exist everywhere. Malls sell goods but also provide proper environments to spend our leisure time. Within this context, it is certain that malls play an important role in our ordinary lives. However, malls are mostly developed and operated by private corporations, and therefore, are often left outside of urban planners' interpretation.

This study is an investigation to trace the developments of malls by private sectors to take into account as important urban elements. Although general retails can be simply addressed as functions attributed by land use category, malls are not just an ordinary type of commercials. Instead, with their extra functions like leisure attractions and cultural event spaces, they sometimes serve as centers of town or even substitute traditional urban downtown's functions. From this perspective, analyzing the location pattern of malls and asking the reasons behind in a planner's view point will be a meaningful investigation.

Specifically, this study will analyze malls in Texas by relating the decennial changes of location factors to the actual locational distributions of malls. By doing so, we will be able to see how the development of malls has to do with the city's overall development and spatial change.

1.2. Organization of the thesis

This thesis is organized into five sections. After the introduction, we will proceed a literature review. In this section, we will first address the concise history of malls in the United States, and review on the retail location theory and check its limitation. Then, we will introduce recent journal articles on spatial issues of malls.

In the research foundation section, we will address the details surrounding our analyses. First of all, we will present the hypotheses of the study and the according research designs, and define the extent of these analyses. Then, we will describe what kind of data are collected, and summarize their sources. Finally, the methodologies for analyses will be also explained in details.

In the analysis on malls part, we will process two types of analyses. First of all, we will do exploratory analyses of the malls, investigating on the spatial distribution of malls of the present time and addressing their descriptive statistics. Then, in the second part, we will proceed the main analyses, by looking at the relationships between the four main factors and the actual locations of malls within the decennial time scale from 1970 to 2010.

Finally, in the fifth section, we will make conclusions based on all these contents and analyses.

CHAPTER II

LITERATURE REVIEW

2.1. Brief history of malls in the U.S.

If we define mall in a broader term as a place to buy goods, we can think of some markets dating back to the Ancient Rome period. Since then, malls or markets have been important ordinary places for the region's commercial activities. By the modern area, malls experienced and accepted several significant trends such as arcade concept, covered roof and enclosed form, and these types of spaces shaped the prototype of today's malls.

In the U.S, modern-type malls began operating at the beginning of the 20th century, although there are different opinions about what first mall is. During the century, people in U.S became more and more dependent on shopping malls for consumptions, with malls occupying over 50% of all retail money spent in the 1987, which were only 14% in 1960 (Feinberg & Meoli, 1991).

The suburban-type enclosed mall first opened in the suburb of Minneapolis in 1956, and spread out to the whole nation as a standard form of mall. This type of mall could be successful because it provided safe, comfortable and predictable places, and so, it became an attractive destination as a center of suburb to drive by car. In this context, the boom of malls can be related to the suburbanization and the increase of private automobile possession, which lasted during the second half of the 20th century.

2.2. Theories on the location of retails and malls

It is often said that the most important element for the success of a retail store is location (Craig, et al., 1984). With such importance, researchers have constructed and developed theories on retail location. The most common standard theory is the 'Central Place Theory' by Walter Christaller in 1935.

The central place theory gives us two basic insights in retails' location decision. First, this model explains the extent of market area of a store by a combination of the two important concepts: the 'range' and the 'threshold' of the goods. The 'range' is the maximum distance consumers may travel to obtain the goods, and the 'threshold' is the store's minimum amount of consumer size to sustain its business. Only as long as the 'range' is larger than the 'threshold', the market area can be economically reasonable (Craig, et al., 1984). In addition, the model also defines the hierarchy of different retail stores, which is basically dependent on the value of the goods. For instance, the more valuable, durable or scarce goods have higher order with larger market area, and thus the stores locate at the top center of the districts. The less valuable or ordinary goods have lower order with smaller market area, and therefore their stores tend to locate at the various sub-centers.

This theory gives us an idea that the value of goods in context of hierarchy and consumers' willingness to travel, and the transportation costs are the important factors for the location of malls. However, by relying on this theory exclusively, it is hard to explain the reason why, in the real world, retail exists here and not there, although the

two places have a similar hierarchy level. We may have other factors that can help explain the actual locations of businesses.

There are some suggestions on the realistic factors for retails' location decisions. The study by Carlson (2000) tells us important factors for firm location, which can be a good starting point to look at the factors for a retail location. According to the study based on a survey and statistics in the Chicago metropolitan area, among several factors, the transportation accessibility and the land availability and costs, were seen as primary consideration elements for firm location in general. In addition, there is a study by Cohen and Lewis (1967) which deals with the elements for shopping districts location based on the analysis on Metropolitan Boston's retail areas. The study mentions situation, population, highways, political organization and competition as elements that have a relation to shopping area distributions. Moreover, the study also incorporated population density, income level, location and quality of competition, and access as 'service area components' to address structural patterns of retail areas (Cohen and Lewis, 1967).

2.3. Recent research on malls and related spatial issues

Malls have been studied in a variety of disciplines, including consumer sciences, management and marketing sciences, real estate studies, and urban studies. If we narrow down to topics on the spatial issues of malls, we can summarize three different categories. They are the investigations of the malls' shopping environment itself, the

studies on the influences of malls on the urban environments, and the research on the dynamic interactions between urban elements and malls.

First, there are some studies that focus on the influence of malls' spatial condition on shopping behaviors or on profits, especially in the field of consumer sciences and management studies. For instance, Joseph et al. (2007) addressed the attractive factors of malls by looking at the scale of malls and the existence of Cineplex and analyzed if they have influence on consumers' frequent visit to the malls. In addition, Michona et al. (2002) processed a survey-based research on the influence of mall environment on individuals' shopping behavior. These studies often focus on the inside of malls, and so, the locations and geographic settings are usually not taken into account.

Second, a variety of research exists on the urban and social impact of malls. This type of study deals with the spill-over effect possibilities of the mall development toward the larger environments. For example, Crosby et al. (2005) addressed the land use impact of the large shopping center on smaller existing retail stores, by comparing different years' statistics and land use data. In addition, in her 2005 research, Lowe processed qualitative analyses on the influence of inner city shopping center on the city's regeneration. Meanwhile, some researchers dealt with this topic using quantitative analyses. For instance, West and Orr (2003) did regression analyses based on the survey on mall consumers' behavior and perception, to see how downtown malls can drive the city's economic development and civic pride.

Finally, there are some studies that focus on the interactions between urban conditions and malls. This type of study basically sees malls not just as the sources of spill-over effect, but as dynamic entities which not only are affected by urban conditions but also are influencing on them. A paper by Rotem-Mindali (2012) is a good example of this type of research. With an ecological perspective, the author addressed the fragmented retail distributions of a city in Israel in relation to various accessibility options. By doing so, the study was able to see how retails are affected by existing transportation infrastructure, as well as, how they are changing customers' actual accessibility. Karrholm et al. did a study on the interdependence between retail areas in a Swedish city. (2012) This research also dealt with the dynamics by looking at how the independent developments are combined together and thus changing the urban environments.

CHAPTER III

RESEARCH FOUNDATION

3.1. Hypotheses and research design

This study is an attempt to understand the location pattern of malls and the reasons behind it. Specifically, we are posing two core questions as follows:

1. What are the spatial distributions of malls?

2. What affects the geographic location of malls?

To address these questions, we propose four elements that are assumed to affect mall location, based on the literature review process in Chapter 2.2. They are highway nodes, land availability, population density and household income level. These elements form the core of the independent variables of the research framework. (See Fig. 1)

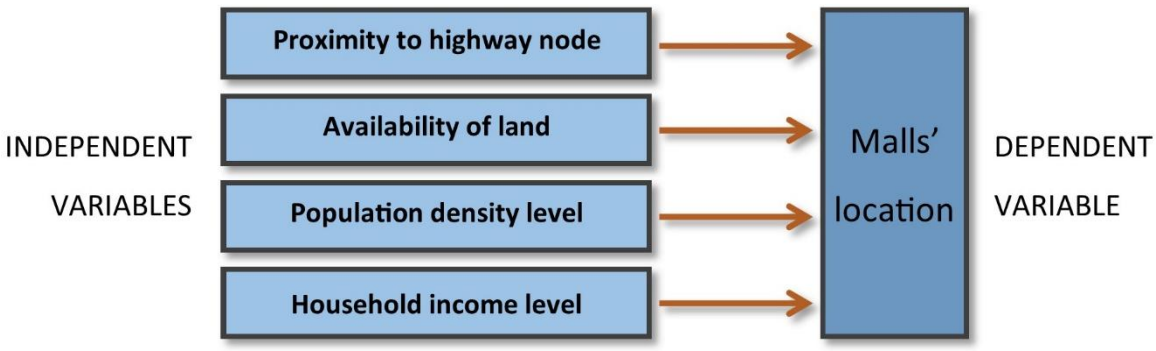

Figure 1. Research framework

Within this research framework, we developed four hypotheses as follows:

1. The places with closer proximity to highway nodes will be more likely to have a mall.

2. The places with more available land will be more likely to have a mall.

3. The places with higher population density level will be more likely to have a mall.

4. The places with higher level of household income will be more likely to have a mall.

To test these hypotheses, a structured research design is developed. First of all, we will analyze the association between the proximities to highway nodes and location of malls, by looking at maps with highway networks and mall distributions. Second, we will address if the places with more available land have more chances to locate malls, using land cover data and mall location maps. Then, by analyzing maps of population density distributions overlapped with mall locations, we will investigate on the positive association of population density with mall location. Finally, an analysis on the possible preference of higher income level district for mall location will be processed, using maps that show us distribution of malls and average household incomes.

All these sets of studies will be done under systematic procedures. Specifically, above all, we will process all the analyses in a decennial time-series framework from 1970 to 2010. By doing so, we will be able to see how the current pattern of the factors is affecting the mall location of the next time phases. In addition, we will analyze four metropolitan areas with the same analytical structures, so that we can make a stronger and more intensified reasoning. Finally, from time to time, we will make comparisons

across the analyses with different factors to see, for instance, if there is any priority among factors for mall location, or if there is any chance to explain some questionable sectors that are showing deviating patterns.

3.2. Study scope

The scope of this study can be described in terms of spatial extent and time scale. First of all, for the spatial scope of the study, we will basically cover malls located in the State of Texas. The reason of this decision is, above all, because Texas is a second largest state in U.S, and naturally has comparably many malls in it. In addition, due to the hot climate, metropolitan areas in Texas have less developed downtown activities compared to other major U.S metropolitan areas, and therefore, we can expect that Texans may prefer indoor activities including shopping and malling in enclosed malls. These factors can support the idea that malls in Texas have higher importance to be the research target.

For the time scale, this research will focus on both the current state and the changes over time, respectively. First, in the exploratory analysis section, we will focus on the current state of the malls. Specifically, we will deal with data on Texas malls in 2013, to see their spatial distributions themselves and make comparison of information through descriptive statistics. Second, in the main section, time series analyses will be done to see the factors for mall location. We will be dating back to the 1970s and go through the mall distribution maps in relation to possible factors in a decennial phase

until the 2010, in order to see how the changes in mall location took place over time and what the reasons were behind.

3.3. Data collections

3.3.1. Data on the malls

The starting point to collect data on the malls was the list of malls in Texas found at Mallseeker.com website. On the website, we could get the list of 81 malls, their original websites, street addresses and the number of stores and restaurants in each mall. At each mall's website, we double-checked the address and ZIP code, counted the number of stores, restaurants and department stores, and found out the management corporations, as necessary.

In addition to collecting and checking the basic information, we spent more time to collect more detailed data. To be more specific, we could get the built year data and the Gross Leasable Area (GLA) information by looking at each mall's leasing brochure, local newspaper records and retail news statistics, etc.

Finally, to get some information on the current performance of each mall, we had to try several strategies, since vacancy rates are usually part of the company's private data which are not accessible by outsiders. After several trials, the method we chose is to look at the mall's store maps in each website and manually count the number of vacant spaces for stores. Although it was impossible to get the vacancy data of all the malls due

to the lack of precise store maps in some cases, we could successfully get 64 malls' vacancy information. The vacancy rate was calculated by dividing the number of store plots in use by the total number of store plots in each mall.

	Street address /ZIP codes	Number of Stores/restaurants /department stores	Built year	Gross Leasable Area (GLA)	Vacancy status
DATA SOURCE	• Mallseeker.com • Each mall's website	• Mallseeker.com • Each mall's website	• Each mall's leasing brochure • Local newspaper records • Retail statistics	• Each mall's leasing brochure • Local newspaper records • Retail statistics	• Manual counts in each mall's store map

Table 1. Mall data sources

3.3.2. Data for mappings

Basically, in this research, most of the study areas are analyzed in the Census Tract level. The reason for that is because this level seemed to be proper to our research which not only is investigating on the location pattern in metropolitan scale, but also is making comparison between different areas.

To create maps, the most essential data we need are the area's land subdivision and boundary polygons. The polygons of boundaries in census tract level for this research are found in two sources, as the historic data did not exist in U.S Census Bureau. Therefore, we searched the U.S Census Bureau TIGER section for the 1990, 2000, 2010

data and the National Historical Geographic Information System (NHGIS) website for the 1970 and 1980 data.

In order to make the land availability maps, we need to find the land cover maps. However, since these types of data are usually manipulated and released by few official public agencies, we were unable to get the data dating back to the 1970s or the data matching to the exact decennial timeline. The final data we got are land cover maps of the whole U.S of 1992, 2001, 2006 in raster file format, from US Geological Survey (USGS) Land Cover Institute website.

		1970	1980	1990	2000	2010
MAPPINGS	**Census tracts**	NHGIS	NHGIS	US Census /TIGER	US Census /TIGER	US Census /TIGER
	Land cover	N/A	N/A	1992: USGS	2001: USGS	2006: USGS
	Transportation	Manual editing from map	Manual editing from map	Manual editing from map	Manual editing from map	US Census /TIGER
DEMOGRAPHICS	**Population**	NHGIS	NHGIS	US Census	US Census	US Census
	Median Household Income	NHGIS	NHGIS	US Census	US Census	US Census

Table 2. Data sources for mappings and demographics

When it comes to the transportation data, we had to do several manual coding processes due to the lack of data availability. Specifically, we could easily find out 2010 primary and secondary road maps in Texas from U.S Census Bureau, but data on the previous years were not available. The solution we found is to look at the 1970s, 1980s, 1990s, and 2000s printed maps of each metropolitan area and manually edit the 2010 maps by erasing the highways that did not exist at that time. By doing so we could make highway maps of each year by each metropolitan area, which are precise enough to process the analyses.

3.3.3. Data on demographics

The demographics data we used in this research are basically the Census data available for public. To be specific, we were looking for the population data and the median household income information of the 1970, 1980, 1990, 2000 and 2010, and they were found in two different websites. For the data of 1990, 2000, 2010, it was possible to download from the U.S Census Bureau websites. In terms of the data of the 1970 and 1980, which were not available in the U.S Census Bureau, we could successfully get them in NHGIS websites.

To systematically utilize all these data dating back to the 1970s, a standardization process was needed. Above all, as the income level data for 1970 used different measurement, we had to calculate to make a precise estimate. Specifically, the data available at that time was the ‘Aggregate Family Income’ for each census tract, and thus,

we divided it by the number of families in each census tract, which was calculated by dividing the census tract's population by 3.11, the average family size at that time.

Second, as the dollar value changes over time, we had to adjust them to a standard level in order to make comparisons. Setting the 2010 as the standard point, we applied the inflation rates as followings: the increase of 462% for 1970, 164.6% for 1980, 66.8% for 1990, and 26.6% for 2000, to the standard 2010.

3.4. Analysis methodologies

3.4.1. Creating maps

All the maps in this study are created using ESRI ArcGIS 10.0 as main software. The Census tract level geographic boundaries of each decennial year are first projected on the blank background as the base map. Then, through the ArcGIS's geocoding process using each mall's street address and zip code, we were able to place the 81 malls on the corresponding location.

Under this core map with mall distribution, we added geographic distribution data of road networks, land cover, population density and median household income as necessary. To keep the overall consistency, all the color scales for population and income level are applied with the same color spectrum and the same category sizes, throughout the 1970 to the 2010. The same was for transportation and land availability, with the same road scale mappings and the same color legends, respectively. Meanwhile,

in terms of the scale of the maps, within each metropolitan area, all the map scales are kept the same through the years to keep the consistency.

3.4.2. Descriptive analyses on malls

Data on malls are primarily collected and organized in Microsoft Excel. The basic table in Excel is then statistically analyzed using IBM SPSS Statistics 19. First, we summarized the data to see the general trends of malls in Texas. For instance, we sorted the data according to the built year and created a graph to see the trend of new mall development. Second, we processed four sets of statistics by relating each mall's built year, operating corporations, their types (non-outlets or outlets) and the metropolitan statistical areas (MSA) to malls' size, performance, and store structures.

In order to get useful data, some basic calculations are processed. For example, in order to measure the performance of each mall, we used the vacancy rate which was calculated simply by dividing the number of operating stores by the total number of stores. In addition, the ratio of restaurant or anchor/department store were computed by simply dividing the number of these facilities by total number of stores.

3.4.3. Factor analyses

The factors for malls' location were analyzed based on the GIS maps created under the process mentioned in 3.4.1. Basically, the four factors of each year including

highway network, land availability, population density and household income, which were considered as major factors for mall location, are related to the actual location of malls of each year. Moreover, the influence of each factor could be more logically analyzed in the study by looking at the changes of these relationships over the years. For instance, when there is an increase in population density in a certain area, we checked the pattern of new mall location in the next decennial year to see if the increased density has to do with new mall constructions.

These analyses are done repetitively within four metropolitan areas including Dallas Fort Worth, Houston, San Antonio, and Austin. By doing so, we could get several benefits. Above all, as we can compare the similarities and differences between cases with different geographic settings, we were able to see various patterns and relationships of factors to the mall locations. Moreover, with four times more sample cases, we could process more accurate reasoning and make more intensified conclusions.

CHAPTER IV

ANALYSES ON THE MALLS IN TEXAS

4.1. Exploratory analyses of malls

4.1.1. Spatial distributions

The 81 malls are located with some apparent patterns, and these have several relationships with the urban structures and characteristics of Texas. Above all, there is a clear distinction between the west and the east part of the state. When we separate the west and the east symmetrically, the east part has about 86% out of all 81 malls in Texas. In addition, while malls in the west tend to locate with 150~300 miles of distance between each other, those in the east has a tendency to be sited with closer proximity between each other, especially in the metropolitan areas.

Second, while there are no malls in the southwestern plains, several malls are sited along the border between the U.S and Mexico. These malls are generally located in small or medium sized cities of borders like El Paso, Del Rio, Laredo and Brownsville. Some of these cities form twin cities with adjacent Mexican cities, such as El Paso-Juarez, Laredo-Nuevo Laredo and Brownsville-Matamoros. With these findings, we may argue that the malls are sited here in order to share market areas across the territories of Mexico.

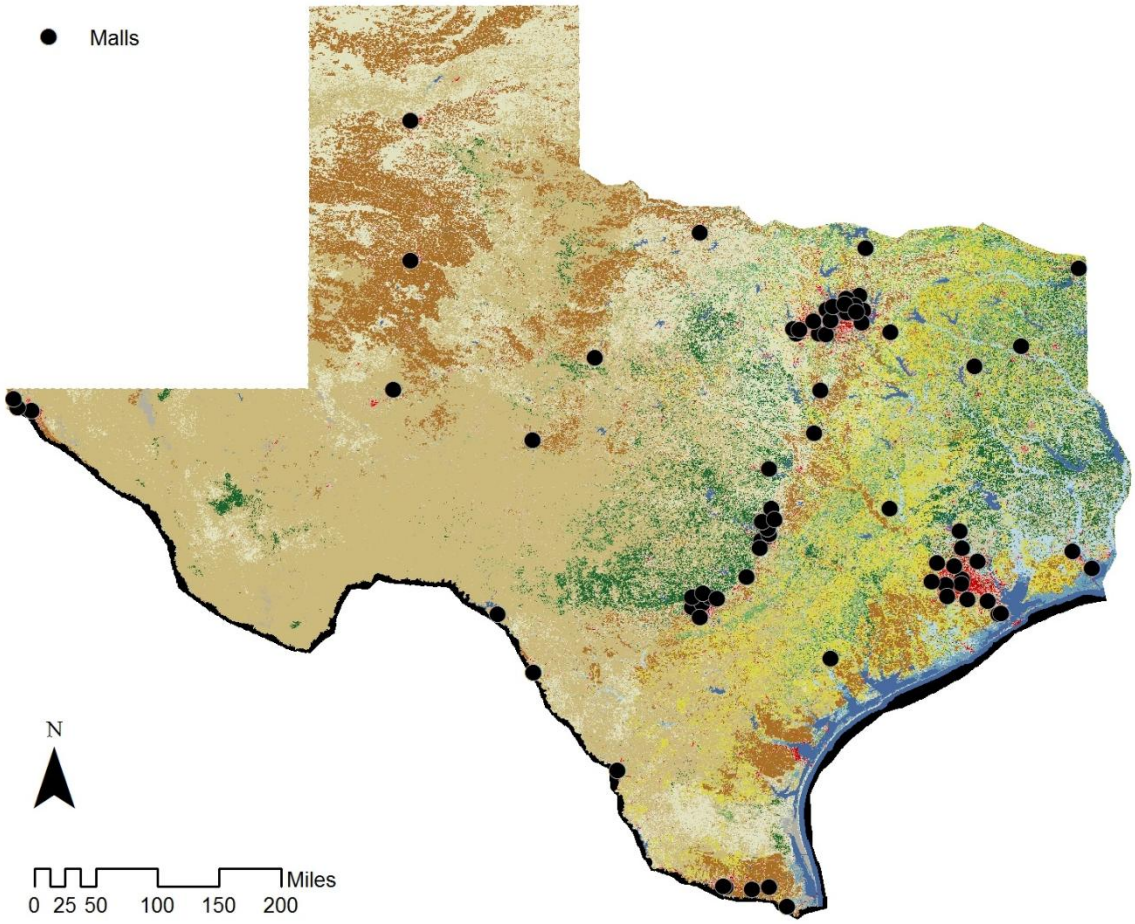

Figure 2. Spatial distribution map of malls in Texas

Texas Metropolitan Statistical Area	Population*	Malls	Ratio (capita per mall)
Dallas-Fort Worth	6,526,548	20	326,327
Houston	6,086,538	13	468,195
San Antonio	2,142,508	7	306,072
Austin	1,716,289	13	132,022

* 2010 US Census estimates

Table 3. Population and malls in Texas metropolitan statistical areas

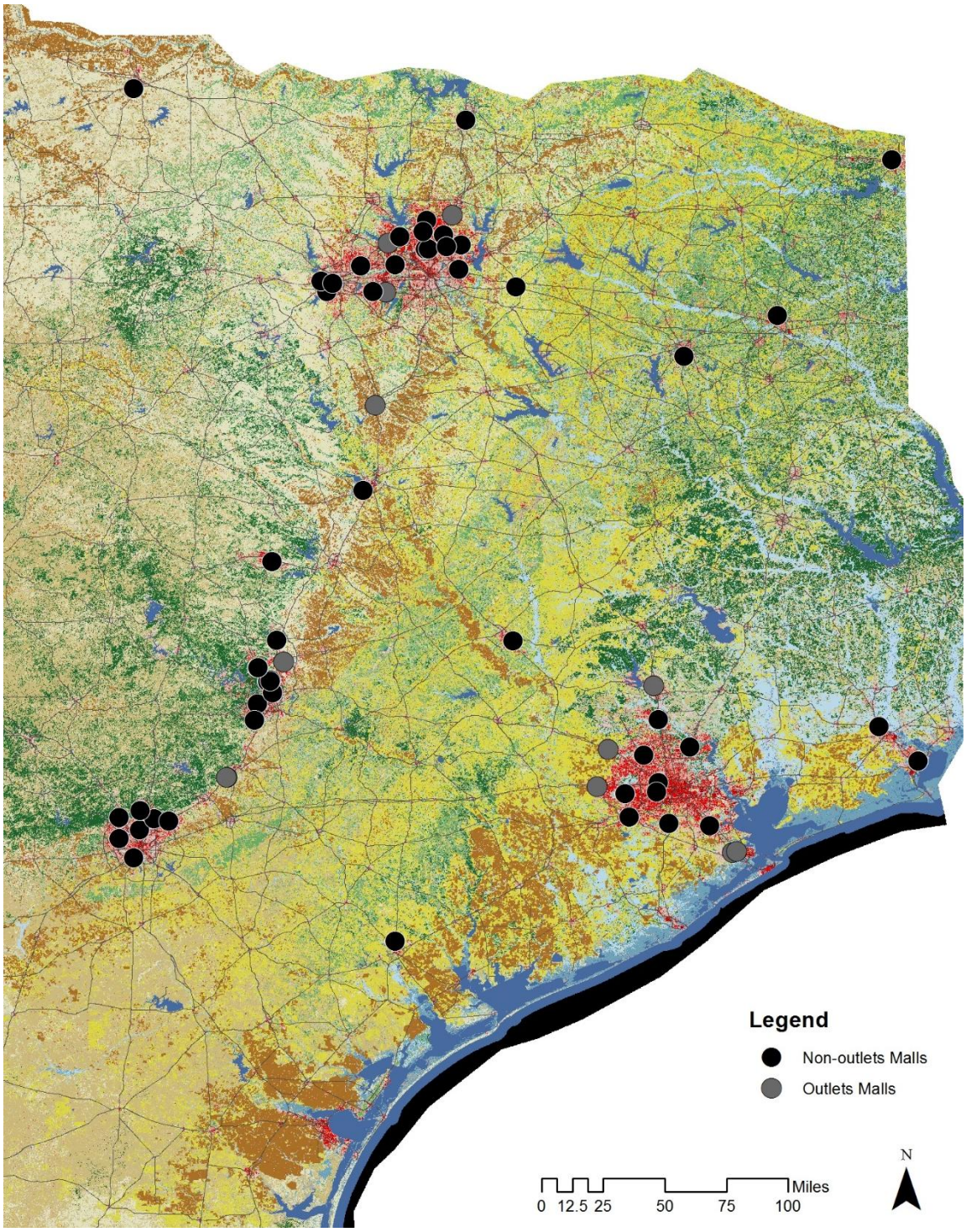

Figure 3. Spatial distribution map of non-outlets and outlets malls in east Texas

If we get closer to the 'Texas Triangle' area at the eastern part of Texas (Fig. 3), the distribution of malls themselves display where the four major metropolitan areas of Texas are, and how they differ in scale. For instance, the apparent four groups of mall concentration correspond to Dallas-Fort Worth, Houston, San Antonio, and Austin area, which has 20, 13, 7, 13 malls respectively. Meanwhile, the comparably larger amount of malls in the Austin area is probably because malls here are smaller in size compared to other places. (See Table 3 and Table 8)

The forms of mall groups can be related to the urban forms of each city, to some extent. For example, the large size of mall concentration in DFW and Houston can be reflections of their bigger size compared to San Antonio and Austin. Moreover, the looser shape of the mall cluster in the Houston area can tell us that this city has a more dispersed urban form compared to other three cities, which have apparently denser mall distribution forms. Meanwhile, the linear mall distribution pattern in Austin can be a reflection of Austin's linear development due to its topographic conditions.

Finally, malls excluding those within four metropolitan areas in the east Texas are generally located with around 100~150 miles of distance between each other. This is apparently closer than malls in the west part of the state.

When it comes to the differences between outlets and non-outlets, we may see a tendency that outlets are located at the outer parts of each metropolitan area. This pattern of location is especially apparent in Houston with outlets on the outskirts of the metropolitan area. In the DFW area, also, outlets are at the north or south part of the

whole metropolitan area, compared to non-outlets which are located either within Dallas area or Fort Worth area. Meanwhile in San Antonio and Austin area a set of two outlets is located in a similar 50 miles distance from each other, sharing the market boundaries of both metropolitan areas.

4.1.2. Descriptive statistics

4.1.2.1. By built year

Malls were built since the 1960s. The first mall opened in Texas is the North Star Mall in San Antonio in 1960, and after 8 years of nothing, a sudden boom of mall development began and this trend went through the significant top at the years around 1980. Since then, Texas had some steady but more or less fewer mall development trend through the 1990s, with a slight increase of openings in the mid-2000s. (See Fig. 4)

In terms of mall size, those built in the 1970s tend to be largest in scale with a gross leasable area (GLA) above 1,000,000 square feet. According to the total number of stores, the 1970s remains the first, too, but malls of 2000s had similar amounts of total stores. This can show us that stores in malls of 2000s tend to occupy smaller spaces than before. The smallest are malls built in the 1990s with about 668,622 sf average, but they had more variations in size with the highest standard deviation, compared to other time periods.

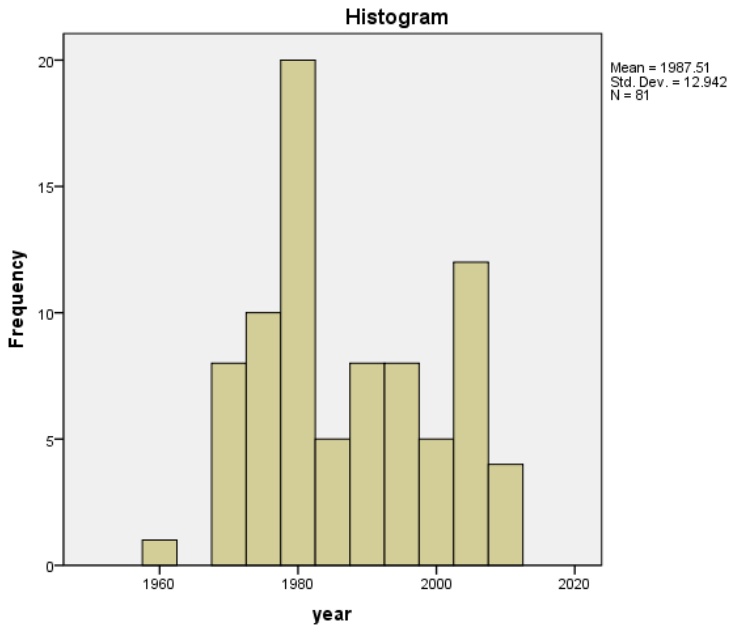

Figure 4. Graph on malls by built year

Differences in the performance of malls in relation to their built years were pretty much apparent. That is, the recently built malls tend to have better performance with lower vacancy rate than those have a longer history, with an exception of those built in the 1960s. Specifically, malls built in the 1970s and 1980s showed average 8.7% and 10.4% of vacancy, while those built in the 1990s, 2000s and 2010s had 3.5%, 5.4% and 1.7% of vacancy rate. In addition, with its highest standard deviation, malls built in the 1970s could be more diverse in performance, probably according to their physical conditions and locations.

When it comes to the store structures of malls, the most apparent feature is that anchor stores are taking smaller portions after the 1990s. That is, after 3.9% and 4.7% of

anchor ratio in the 1970s and 1980s, we had a sudden drop of the index to 1.2%, 1.6% and 0% in 1990s, 2000s, and 2010s. This can be the influence of the outlets boom in the 90s, as outlets usually do not have anchor stores in their properties. Meanwhile, for the restaurant ratio, we have a 5% increase of ratio in the 2000s, but this trend does not last after 2010.

YEAR		GLA (sqft)	Total number of stores	Vacancy rate (%)	Restaurant ratio (%)	Anchor/Dept. store ratio (%)
-1969	Mean	946,937	107	2.43	10.49	2.85
	N	3	3	2	3	3
	Std. Deviation	268,531	48	2.51	0.76	0.93
1970-1979	Mean	1,039,334	118	8.74	11.41	3.94
	N	24	24	23	24	24
	Std. Deviation	437,734	55	11.59	4.17	2.01
1980-1989	Mean	878,095	98	10.43	11.21	4.66
	N	22	22	17	22	22
	Std. Deviation	377,045	41	6.80	4.22	2.69
1990-1999	Mean	668,622	89	3.57	9.07	1.23
	N	12	12	9	12	12
	Std. Deviation	495,000	63	3.18	4.43	1.52
2000-2009	Mean	851,158	118	5.47	14.03	1.63
	N	18	18	15	18	18
	Std. Deviation	435,758	46	5.81	8.04	1.58
2010-	Mean	384,860	98	1.69	10.00	0
	N	2	2	2	2	2
	Std. Deviation	45,452	17	2.38	3.95	0
TOTAL	Mean	879,221	107	7.36	11.52	3.08
	N	81	81	68	81	81
	Std. Deviation	434,832	50	8.42	5.36	2.46

Table 4. Mall statistics by built year

4.1.2.2. By management corporations

Simon Property Group is the most active corporation to develop and operate malls in the Texas area, occupying more than one-third of all 81 malls. General Growth Properties, Inc. and Jones Lang LaSalle are taking second and third places, with 12~14% occupation of the market. CBL & Associates, Rouse Properties and Tanger Outlets are also showing their existence with 6, 3 and 3 malls in Texas, respectively. For the companies with few frequency of developing malls in this area, we have many small corporations such as Glimcher Realty Trust and Sugar Oaks Properties, as well as some larger or global corporations like Macerich and Taubman Centers. (See Fig. 5)

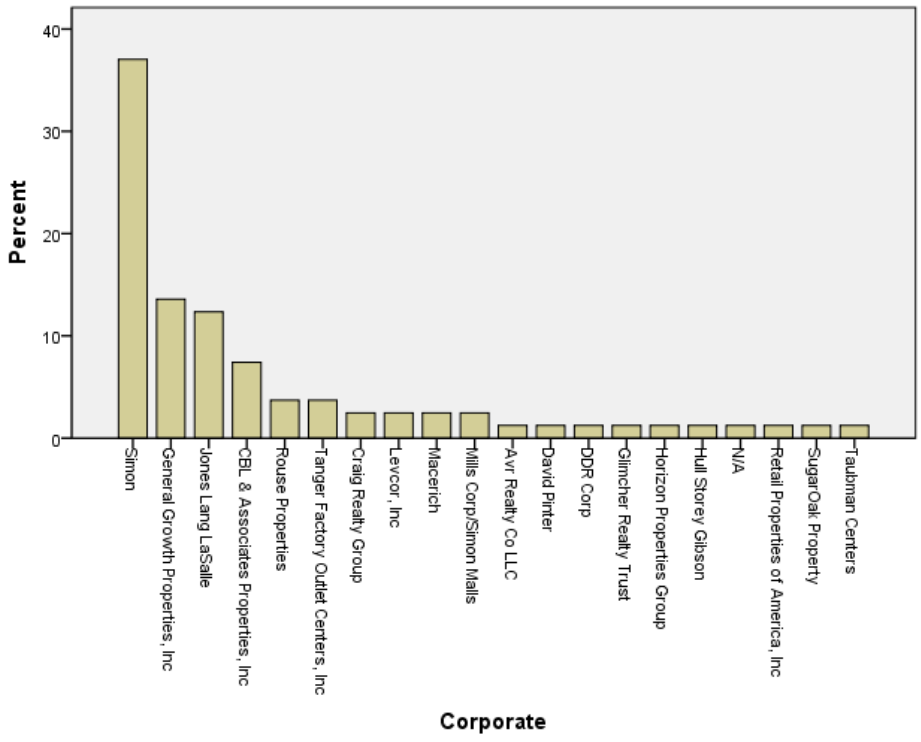

Figure 5. Graph on malls by management corporations

Let us look at some basic features of top 6 frequent mall operators in Texas, which occupy about 78% of all 81 malls in the area. First of all, we can find out that, in general, the frequency of number of malls in Texas tends to be parallel with those in the whole U.S, with around 7-9% in the ratio. However, Jones Lang LaSalle and CBL & Associates have comparably less malls in Texas than in other states, with about 4-5% in the ratio. In addition, the top 6 mall operators all have their bases outside of the state of Texas. This can indicate that the mall retail industry in Texas is mainly not a local business, but a part of the statewide businesses of giant corporations.

Rank in frequency	Corporations	Headquarters	Malls in U.S.*	Malls in Texas**	Ratio (Malls in Texas/U.S.)
1	Simon Property Group	Indianapolis, IN	313	30	9.6%
2	General Growth Properties	Chicago, IL	126	11	8.7%
3	Jones Lang LaSalle	Chicago, IL	228	10	4.4%
4	CBL & Associates	Chattanooga, TN	127	6	4.7%
5	Rouse Properties	New York City, NY	32	3	9.4%
6	Tanger Outlets	Greensboro, NC	39	3	7.7%

* Malls are defined based on the standard of each corporation
** Malls are defined by the criteria of this thesis

Table 5. Comparison of major mall operation corporations

Here we have some comparisons of sizes, performance and store compositions between malls operated by top 6 frequent mall operators. First of all, in terms of size, 11 malls of General Growth Properties have apparently the largest GLA and number of

stores in average, compared to any other cases. They operate an average of 1,307,363 sf of GLA, which exceeds the second largest by about 38%, and also have 152 stores, which is 31 more than the second. The smallest was those from Tanger Outlets, which occupies only about 324,150 sf of GLA with 77 stores. This indicates that although Tanger Outlets have smallest lease area size, they are doing competitive business with the proper amount of compact sized stores.

Regarding the performance, there are huge differences between 6 corporations. First, General Growth Properties and Tanger Outlets are doing best with 2-3% in vacancy rate, which is far below the total average of 7.4% of vacancy rate in Texan malls. On the contrary, Jones Lang LaSalle perhaps has some wrong working malls in Texas, with the highest average vacancy rate of 18% and also with the highest standard deviation.

For the store compositions, there are no such variations. In terms of the restaurant ratio, malls operated by CBL & Associates, Simon Property Group and General Growth Properties have about 1-2% more restaurants than the overall average, while the other three has 2-3% less than the average. For the anchor stores, malls by Jones Lang LaSalle, Rouse Properties and CBL & Associates tend to have about 1 more percent of anchors than the average Texan malls. Those operated by General Growth Properties marked just the average and those by Simon were 1% below average. Meanwhile, Tanger Outlets did not have anchor stores in their malls, probably because they are all outlets, which in general have less anchors than non-outlets.

OPERATION COMPANY		GLA (sqft)	Total number of stores	Vacancy rate (%)	Restaurant ratio (%)	Anchor/Dept. store ratio (%)
Simon Property Group	Mean	842,400	109	4.96	12.76	2.36
	N	30	30	29	30	30
	Std. Deviation	456,491	58	4.99	6.65	2.12
General Growth Properties	Mean	1,307,363	152	1.83	12.70	3.14
	N	11	11	11	11	11
	Std. Deviation	191,333	21	1.63	1.97	0.65
Jones Lang LaSalle	Mean	804,254	90	18.77	9.24	4.57
	N	10	10	9	10	10
	Std. Deviation	345,733	23	14.62	2.88	2.61
CBL & Associates	Mean	886,843	121	8.07	13.21	4.18
	N	6	6	6	6	6
	Std. Deviation	231,376	23	2.54	2.15	1.62
Rouse Properties	Mean	950,373	110	12.00	9.20	4.49
	N	3	3	3	3	3
	Std. Deviation	244,324	27	6.95	1.78	1.64
Tanger Factory Outlets	Mean	324,149	77	2.79	8.82	0
	N	3	3	3	3	3
	Std. Deviation	134,362	35	2.55	3.78	0
Others	Mean	798,710	87	10.68	10.29	3.35
	N	18	18	7	18	18
	Std. Deviation	487,996	54	7.06	6.16	3.34
TOTAL	Mean	879,221	107	7.36	11.52	3.08
	N	81	81	68	81	81
	Std. Deviation	434,832	50	8.42	5.36	2.46

Table 6. Mall statistics by operation corporations

4.1.2.3. Between outlets and non-outlets

As discussed in section 2.1, outlets, which came to appear in the late 1980s had different characteristics compared to the traditional malls. Here, we made comparison between 14 outlets and 67 non-outlets in relation to scale, performance and store structure. In many cases, the differences between these two types of malls were pretty clear.

First of all, for the scale and size, we could find out two distinct messages. One is that the GLA of outlets was significantly smaller with about 588,091 sf in average, which was only about 63% of the GLA of non-outlets. However, the total number of stores, which is the other indicator of scale, was not as different, with 109 stores to 102 stores from non-outlets to outlets. These two factors can tell us that the GLA per store of outlets is apparently smaller than that of non-outlets.

When it comes to the performances, outlets are working far better than non-outlets. That is, the outlets have only 2.9% in the average vacancy rate, while the non-outlets have about 8.1% vacancies. By combining with the findings above, we may assert that outlets have much better performance with similar amount of stores which occupy far smaller spaces, compared to the non-outlets.

Finally, in terms of store structures, outlets and non-outlets are clearly different. For instance, while non-outlets have restaurants in their mall with about 12.5% in the ratio, outlets have only about 6.9% in the ratio. Furthermore, while 3.6% of the facilities in non-outlets are anchor stores like department stores, only less than 0.5% are anchors in outlets. These facts indicate that outlets are probably operated more for cheaper shopping purposes, and can maybe explain one of the various reasons why the GLA of outlets are far smaller than that of non-outlets, as the absence of department stores definitely saves space.

OUTLETS / NON-OUTLETS		GLA (sqft)	Total number of stores	Vacancy rate (%)	Restaurant ratio (%)	Anchor/Dept. Store ratio (%)
Non-outlet	Mean	940,054	109	8.13	12.48	3.63
	N	67	67	58	67	67
	Std. Deviation	401,734	49	8.87	5.11	2.307
Outlet	Mean	588,091	102	2.91	6.93	0.46
	N	14	14	10	14	14
	Std. Deviation	483,576	56	2.14	4.06	1.18
TOTAL	Mean	879,221	107	7.36	11.52	3.08
	N	81	81	68	81	81
	Std. Deviation	434,832	50	8.42	5.36	2.46

Table 7. Mall statistics by outlets/non-outlets

4.1.2.4. By MSAs (Metropolitan Statistical Area)

Interestingly, the four metropolitan statistical areas in Texas which has about 66% of the state's population, occupies about the same 65% of all malls in the area. We addressed here the differences and similarities between malls in each MSA, in the contexts of size, performance and store structures.

First, for the size and scale of the malls, the basic fact is that malls in three MSAs excluding Austin MSA tend to be larger in terms of both GLA and total number of stores, with about 1,000,000 sf GLA and 120 stores. The Austin MSA, however, has only about 735,713 sf of GLA and 94 stores in each mall, both of which are close to the averages of the non-MSAs'. Combining with the fact that the Austin MSA has about double the

number of malls of San Antonio MSA, which has a larger population size, we can interpret that Austin MSA just has more number of smaller size malls.

Second, let us get into the performance side. In general, the Texas MSAs are doing pretty well with comparably smaller vacancy rates than other areas. However, among them, the Houston MSA has the lowest 3.95% of vacancy rate, followed by the DFW MSA with 6.22%, while the two other MSAs were not operating far better than other regions. Especially, the Austin MSA showed us the highest vacancy rate and also the highest variation in the rate, and therefore, we may think that it may have some bad working malls inside.

Regarding the structures and compositions of stores, Austin MSA shows us some points, again. That is, it has a little more restaurants than other MSAs, but a little less anchor stores than others. Although it is hard to find out the plausible reasons why Austin malls have more restaurants with given data, for the less amount of anchor store, we may interpret that as the malls in Austin MSA have comparably smaller size, they may have less anchor or department stores.

METROPOLITAN STATISTICAL AREAS		GLA (sqft)	Total number of stores	Vacancy rate (%)	Restaurant ratio (%)	Anchor/Dept. store ratio (%)
Dallas-Fort Worth MSA	Mean	1,043,846	116	6.22	11.60	2.67
	N	20	20	15	20	20
	Std. Deviation	506,032	53	6.23	5.09	2.46
Houston MSA	Mean	1,050,727	122	3.94	11.11	2.28
	N	13	13	9	13	13
	Std. Deviation	583,521	72	3.15	4.37	1.51
San Antonio MSA	Mean	1,008,867	128	7.35	11.85	3.40
	N	7	7	6	7	7
	Std. Deviation	260,348	38	8.65	4.61	1.23
Austin MSA	Mean	735,713	94	8.13	13.38	1.39
	N	13	13	13	13	13
	Std. Deviation	381,569	51	14.74	7.14	1.61
Others	Mean	716,222	96	8.87	10.72	4.46
	N	28	28	25	28	28
	Std. Deviation	269,947	34	6.34	5.34	2.71
TOTAL	Mean	879,221	107	7.36	11.52	3.08
	N	81	81	68	81	81
	Std. Deviation	434,832	50	8.42	5.36	2.46

Table 8. Mall statistics by metropolitan statistical areas

4.2. Factors affecting locations of malls

4.2.1. Transportation

4.2.1.1. Dallas-Fort Worth

In the 1970s DFW transportation map, we can see that malls are generally located along the highways, except for the one 1977 case. Specifically, five malls are sited in the intersections of two or more highways, one mall along one highway line, but the last one in the middle of nowhere. The pattern shows us that malls at that time generally liked the intersections of highways for location, with a slight preference for Interstate Highways (IH) over other highways.

In 1980s, there are several important transportation changes in DFW area. For instance, we had the construction of IH 20 which links the south parts of Fort Worth and Dallas, and the construction of IH 820 at the west part of Fort Worth. In addition, State Highway (SH) 190 was built at the north outer part of Dallas. These new highways may have affected the location of new malls, as two of them are built along these highways. Two other new malls are also built at the intersections of existing IHs and other SHs.

During the 1990s, some extensions were processed in existing IHs, but no malls were built at that time. However, the extension of IH 635 may have influenced on the location choice of Grapevine Mills in 2007, which could have better accessibility from Dallas by the extension. Meanwhile, in the 2000s, new malls still have a tendency to locate at the intersections of highways, but there is no clear preference of IHs over other highways as was before.

4.2.1.2. Houston

In 1970s Houston area, the two malls were located at the intersections of two highways. One was at the node of two IHs, and the other was at the node of an IH and a US highway. However, districts with more crossing highways like the downtown area did not have any mall. With these facts, we may think that malls at that time favored highway intersections, but the degree or intensity of nodes were not as important.

In 1980s, the completion of the outer-ring highway, the Sam Houston Highway, became a new important factor for the location of new malls. Specifically, from 1978 to 1984, all four new malls were built on the outside of the outer ring SH. Although three of them are not adjacent to the outer ring, we can still suggest that the increased accessibility along the outer skirt of the city would helped the location of new malls on the outside of the ring highway. In addition, malls tend to like the places along highways, with an exception of the West Oak Mall, which is built along smaller county level road.

When it comes to the 1990s and 2000s, we can see the importance of IH and US highway over the outer ring SH. That is, all the seven new malls built after 1994 are further away from the city and the past outskirt, and sited along several highways but with no clear proximity to intersections. This finding can tell us that recent malls in Houston do not take into account the road connections as an important factor for location decision. To summarize, in Houston area, the highways were always important factors for mall location, but the tendencies and weights have been changed over time.

4.2.1.3. San Antonio

In the case of San Antonio area, strong highway networks were built before the 1970s and did not change much over time. In the 1970 and 1980 map, three malls were sited along the IHs. Although all three places are not the intersections of two IHs, they had other highways crossing close to the districts. Therefore, we may say that malls' location at that time considered the existence of the IH first, and the availability of crossing roads second.

During the 1990s, the preference of IH continues, but the outer ring of the city has also become an attractive location as its construction is completed. Above all, a two-outlet-mall cluster is built in the early 1990s in the northeast suburb along the IH heading to Austin. Its location decision is probably based on the consideration of frequent trips between two big cities in the area. Meanwhile, a new mall opened in 1988 along the outer ring road, although it was a smaller SH. This location pattern became a basic trend in the 2000s.

In the 2000s map, we can see a definite pattern of mall locations along the outer-ring SH, but they differ in condition. That is, while two malls are located close to the intersections of the ring highway and IHs, the two others are located with a little distance from these highways. To summarize, in the San Antonio area, the nodes with one or more major highways are the favored location options throughout the given time periods.

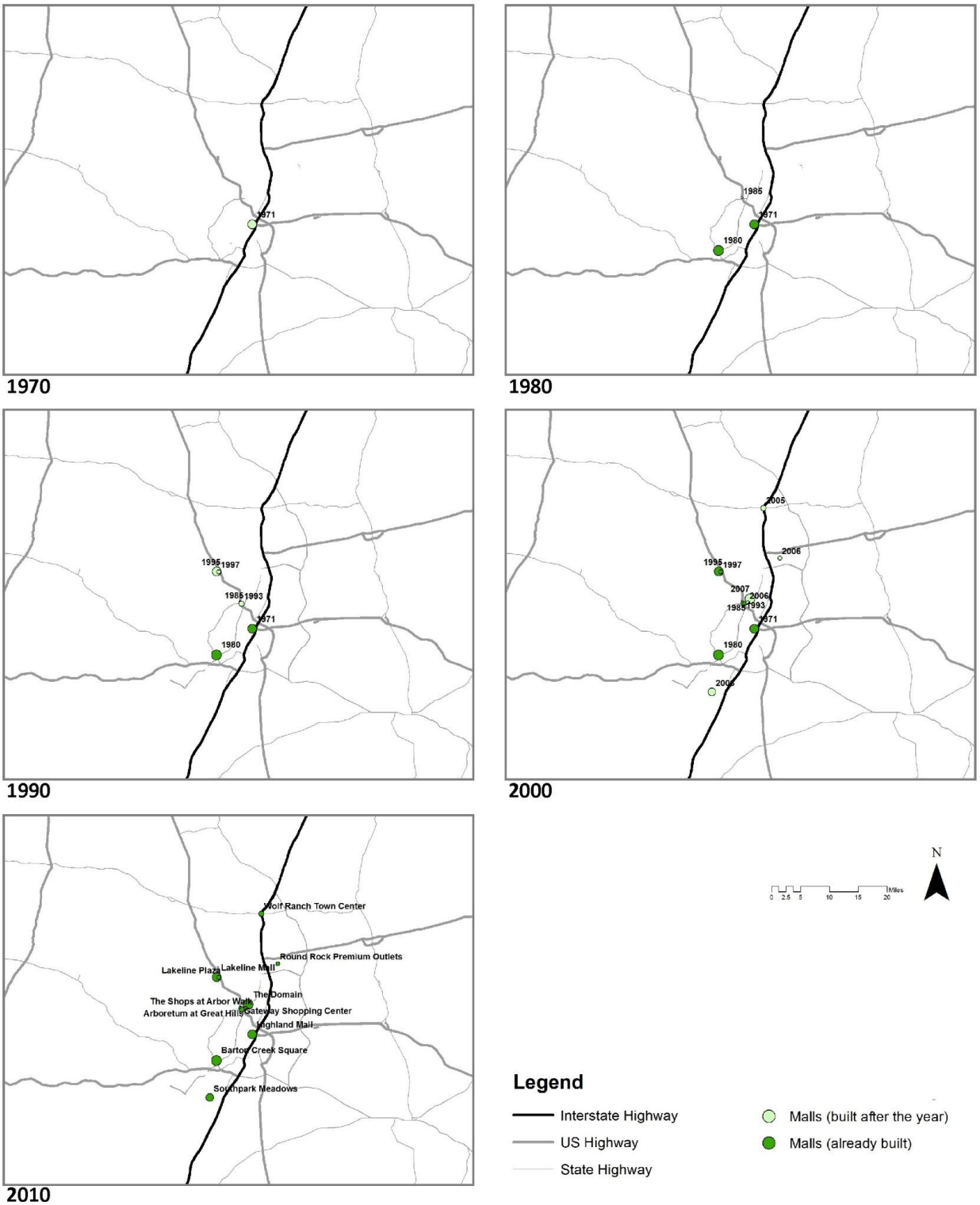

Figure 9. Austin highway networks map

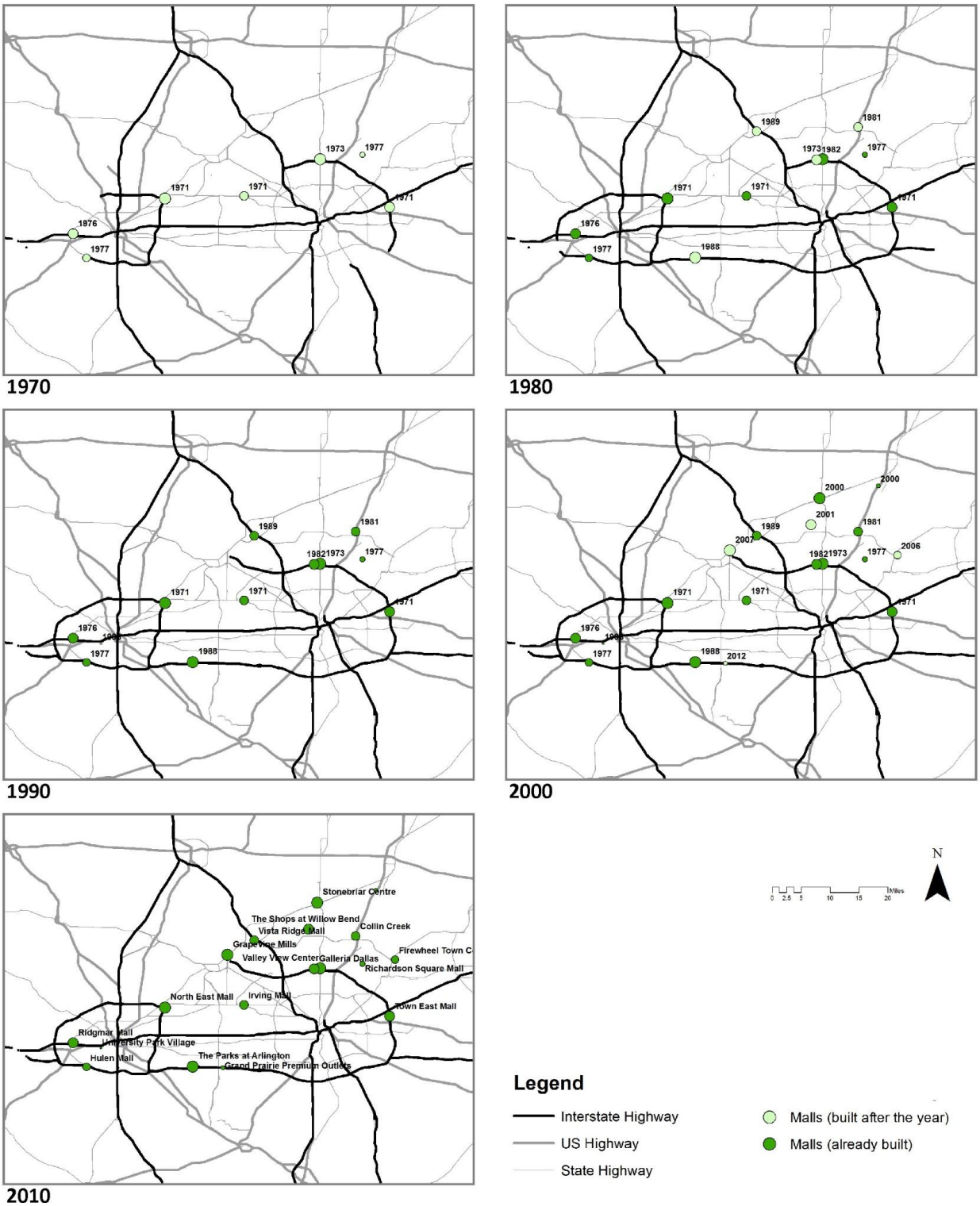

Figure 6. Dallas-Fort Worth highway networks map

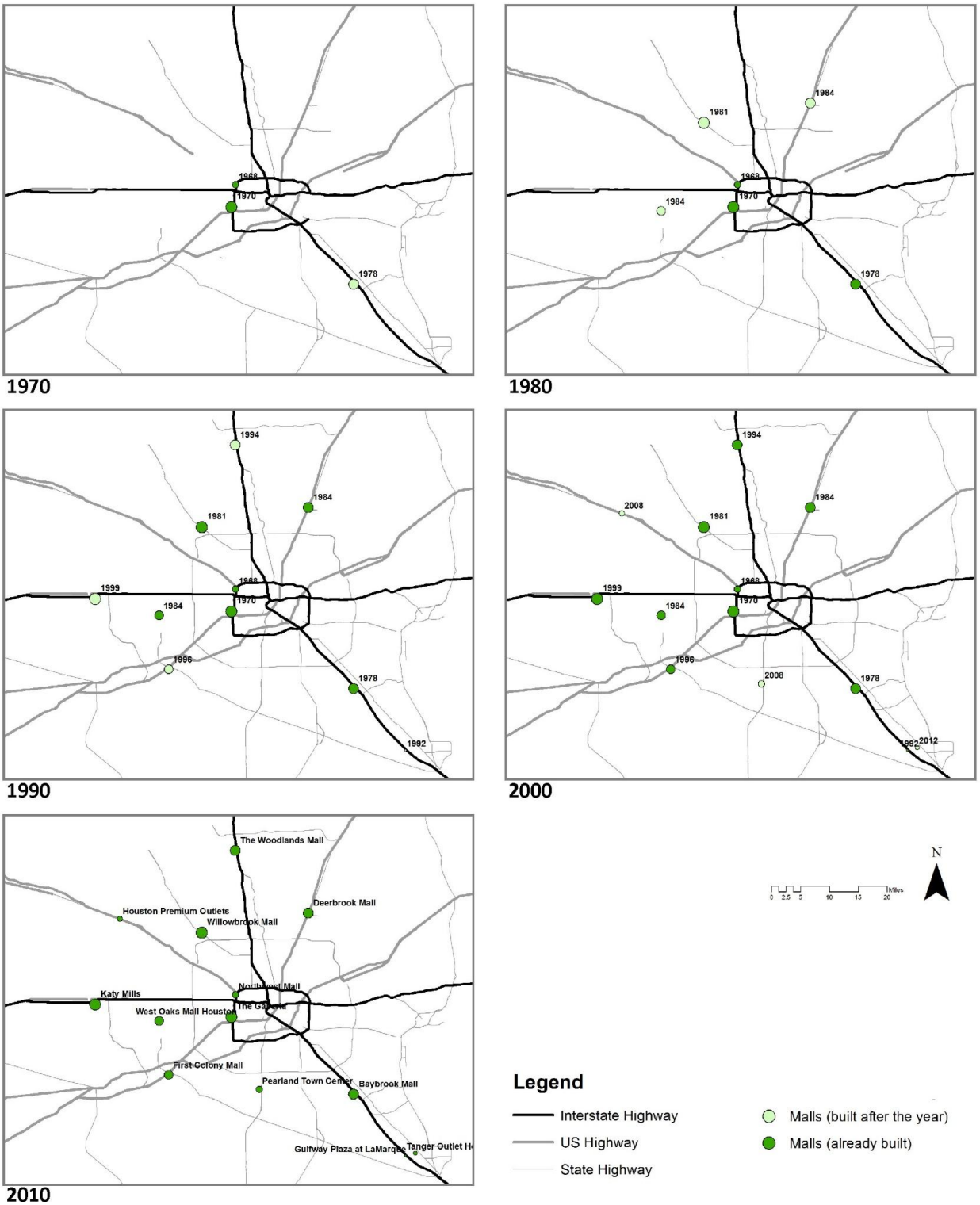

Figure 7. Houston highway networks map

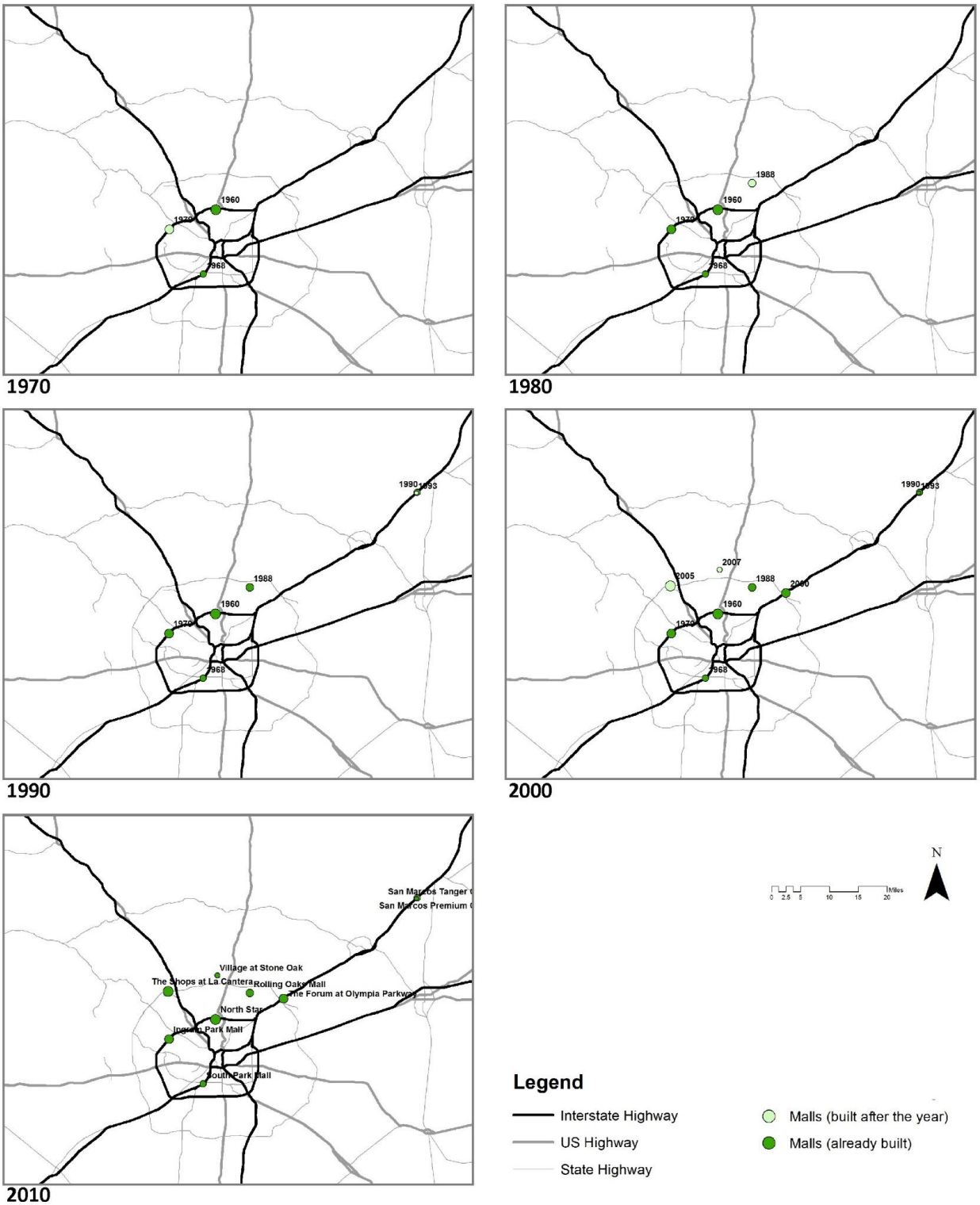

Figure 8. San Antonio highway networks map

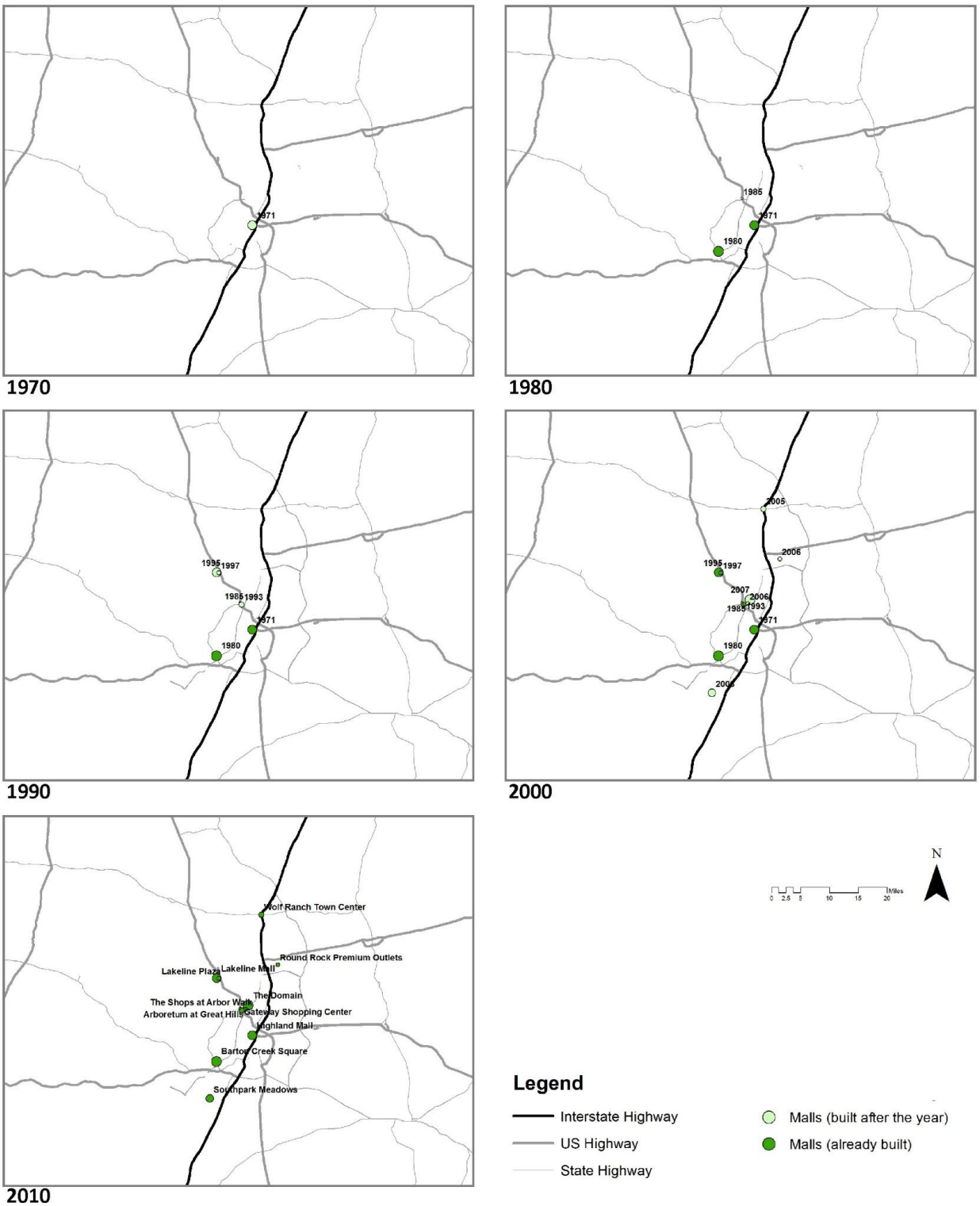

Figure 9. Austin highway networks map

4.2.2. Land availability

4.2.2.1. Dallas-Fort Worth

In the 1992 DFW land cover map, we can see that malls are generally built in developed lands, or at least close to them. Obviously, the development of land itself does not promote the construction of malls, as it is shown that largely developed lands in downtown area do not have malls. However, the places where malls are located are mostly developed land, although they differ in degree. For instance, the Ridgmar Mall and the Valley View Center have broadly developed lands in a close proximity to their north sides. On the contrary, the North East Mall and the Parks at Arlington do not have large developed lands within close distance, although they are huge sized malls.

When we compare the land cover maps of 2001 to 1992, we can recognize a great outer expansion of developed lands, especially to the north side of the DFW. Following this trend, in the 2001 map, most new malls are sited at northern area close to the largely developed lands. In addition, we can see that malls like Vista Ridge Mall, which was not located in a developed lands in the 1992 map, is now surrounded by largely developed lands following the northward city expansion. Meanwhile, in the year of 2006, there are some expansions of land development, too, but the city did not have many new malls' openings.

4.2.2.2. Houston

In the year of 1992, the developed lands were highly leaned to the east side of the city, around the Channel to the Galveston Bay. However, malls at that time were

generally located in the opposite directions. The degree of developed lands in the north, west, and south sides are lower, and thus, the lands around the malls were mostly in less developed conditions. Only the Northwest Mall, which was located close to the city center, was surrounded by comparably highly developed lands.

In the 2001 map, we can see that the land development trend is moved from the east toward the west, northwest and southwest side of the city. The development of new malls was also in the same directions. Specifically, from 1994 to 1999, three new malls were built following those directions, at the outskirt of the city. In addition, by that time, most parts of the city are in highly developed conditions, and therefore most malls are naturally sited on the highly developed lands. The 2006 map shows a similar trend of city expansion and the corresponding establishment of new malls.

4.2.2.3. San Antonio

In the 1992 San Antonio land availability map, we can see that malls are generally sited close to the developed lands, but with some exceptions. First, although its south side is developed land, the north side of the Rolling Oaks Mall is a large endless forest, which is not developed as much until now. In addition, the two clustered malls built in San Marcos in 1990 and 1993 are located with some distances from developed lands.

When we look at the 2001 and 2006 map, there are two clear trends in land developments. The first is the northward expansion of the city, and the second is the

intensification of land development within the city. The new mall constructions are following the former trend, but not the latter. Specifically, the three new malls since 2000 are all built at the northern outskirt of the city, where newly developed lands are encroaching the existing forests.

4.2.2.4. Austin

In the land cover map of the year of 1992, malls in Austin area show two different location patterns. First, three malls which are closer to the central city are sited in more developed lands. Second, three other malls at the outskirt are surrounded by both developed lands and forests.

When it comes to the 2001s map, the forest on the north side of Austin is changed into developed lands, and therefore most existing malls are now sited in developed lands. In addition, new malls built after 2005 are mostly located in the newly developed lands. Meanwhile, it is important to note that as Austin has mountains on the west, its land tends to be developed to the north-southward, and malls are constructed in the similar directions, too.

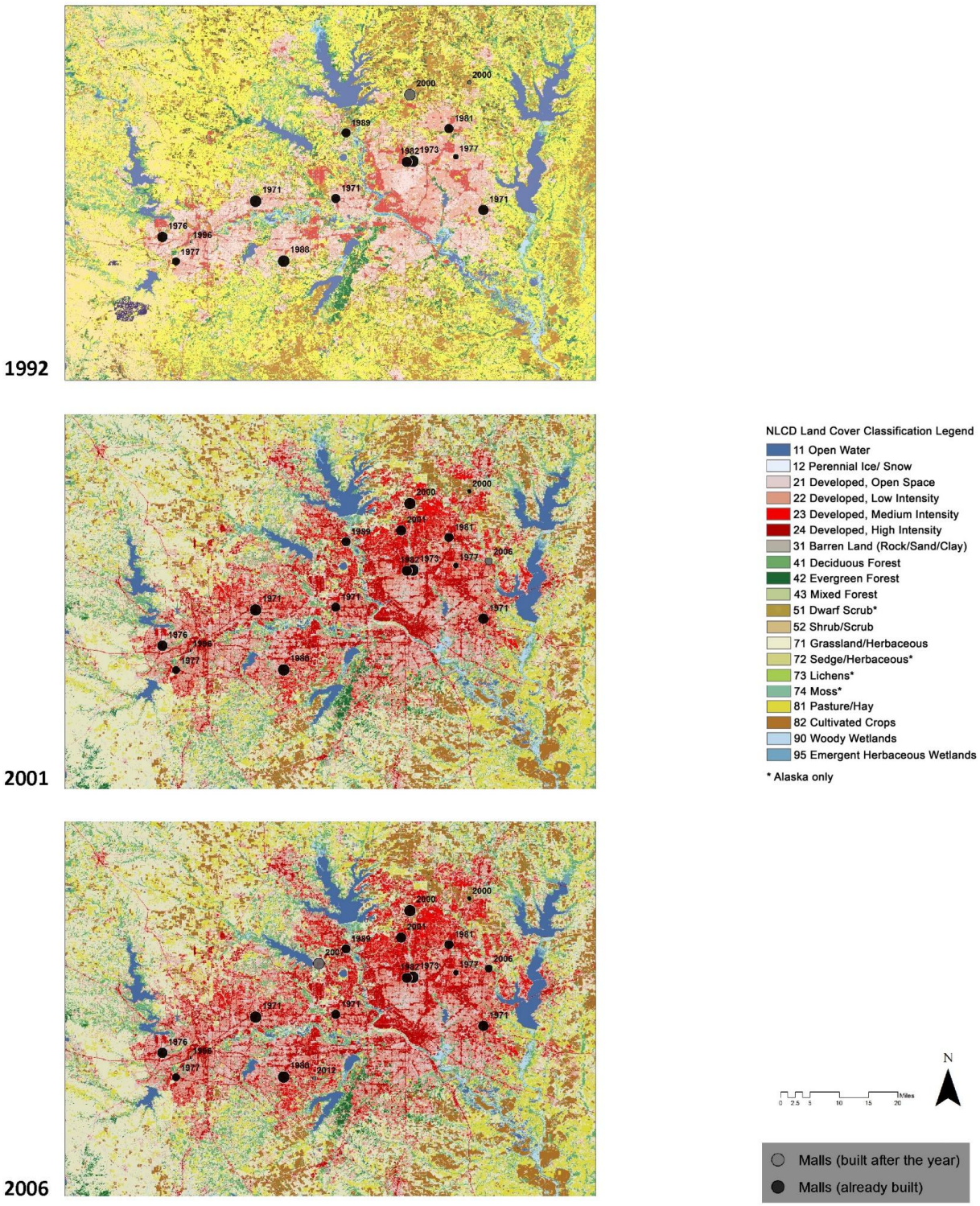

Figure 10. Dallas-Fort Worth land availability map

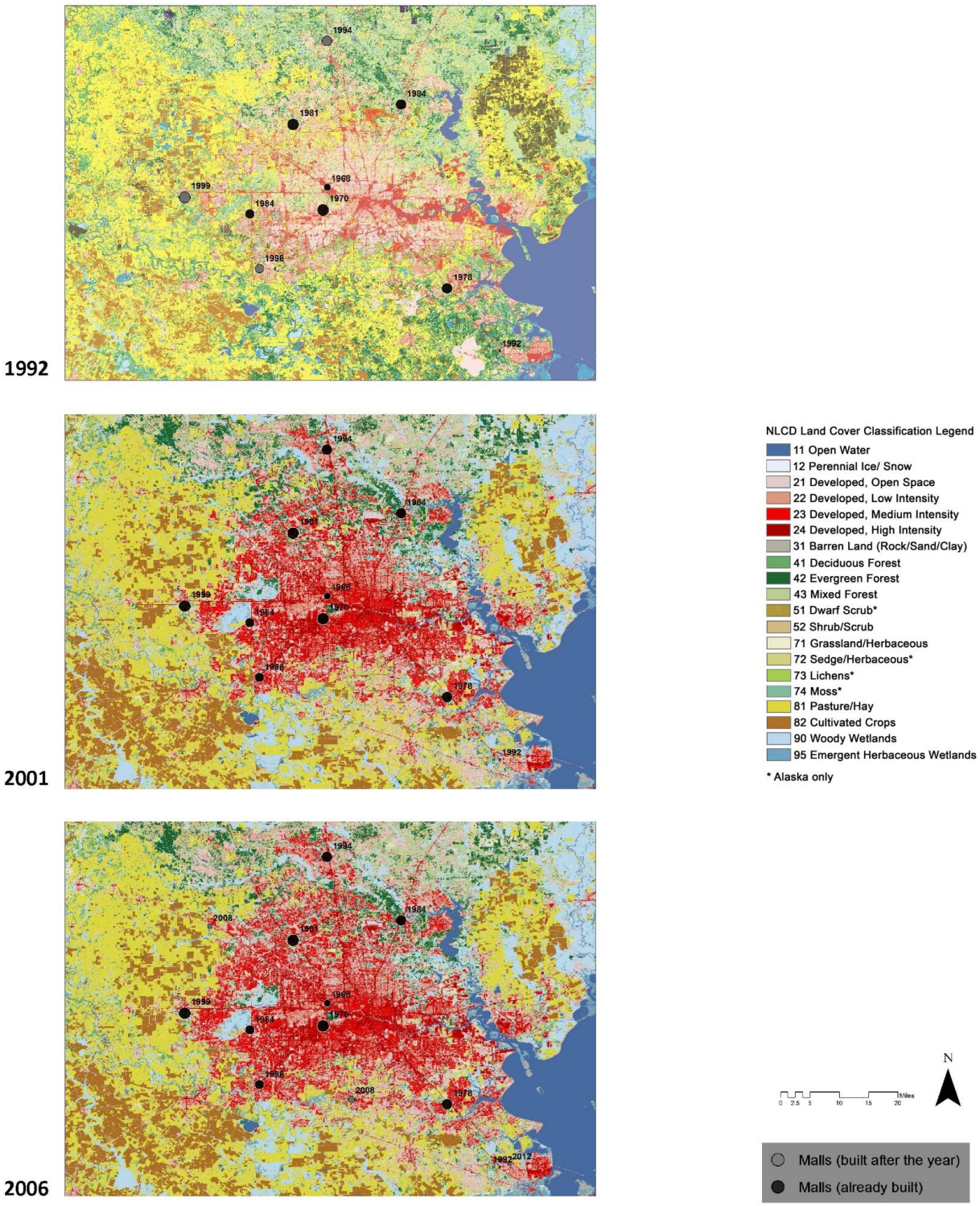

Figure 11. Houston land availability map

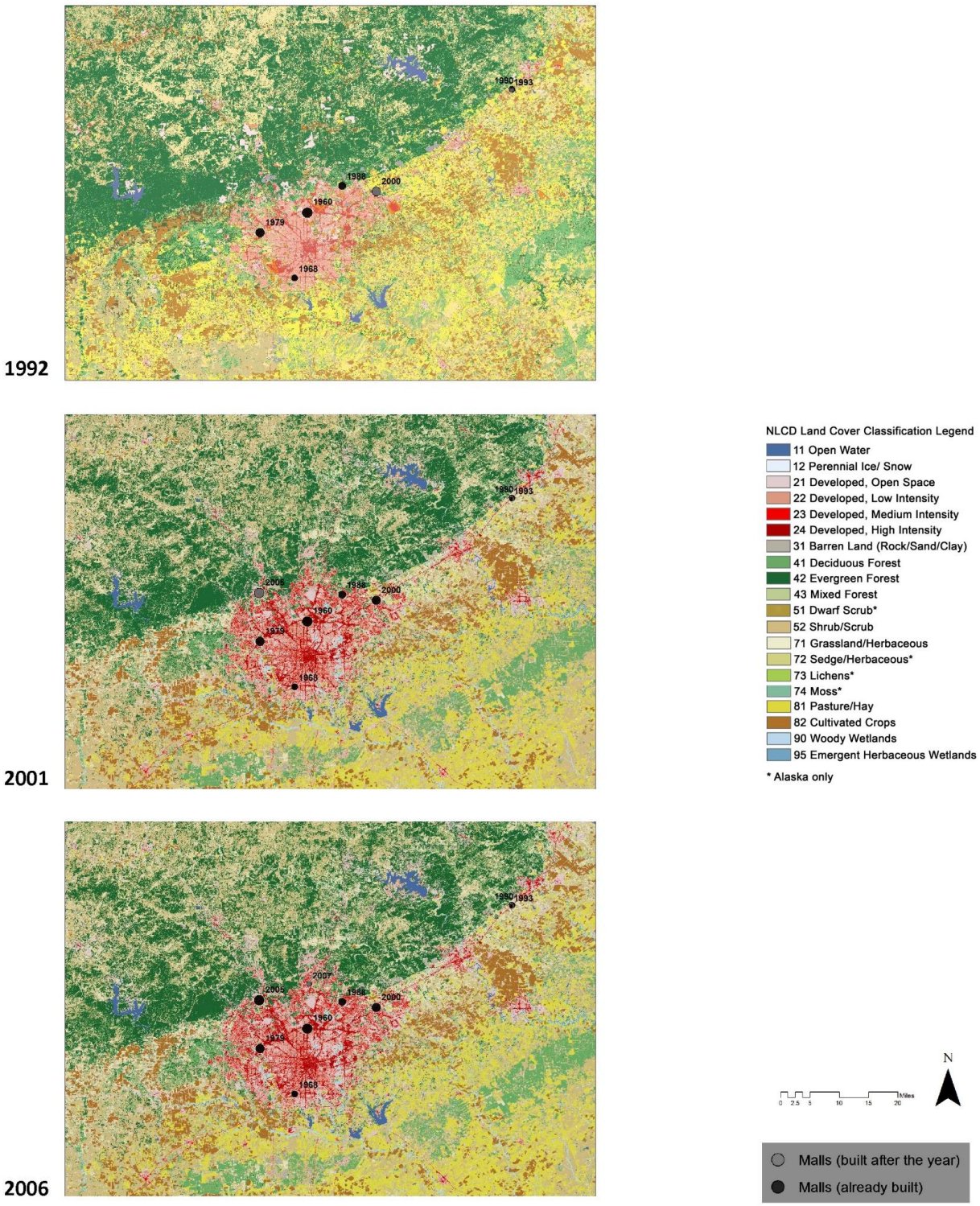

Figure 12. San Antonio land availability map

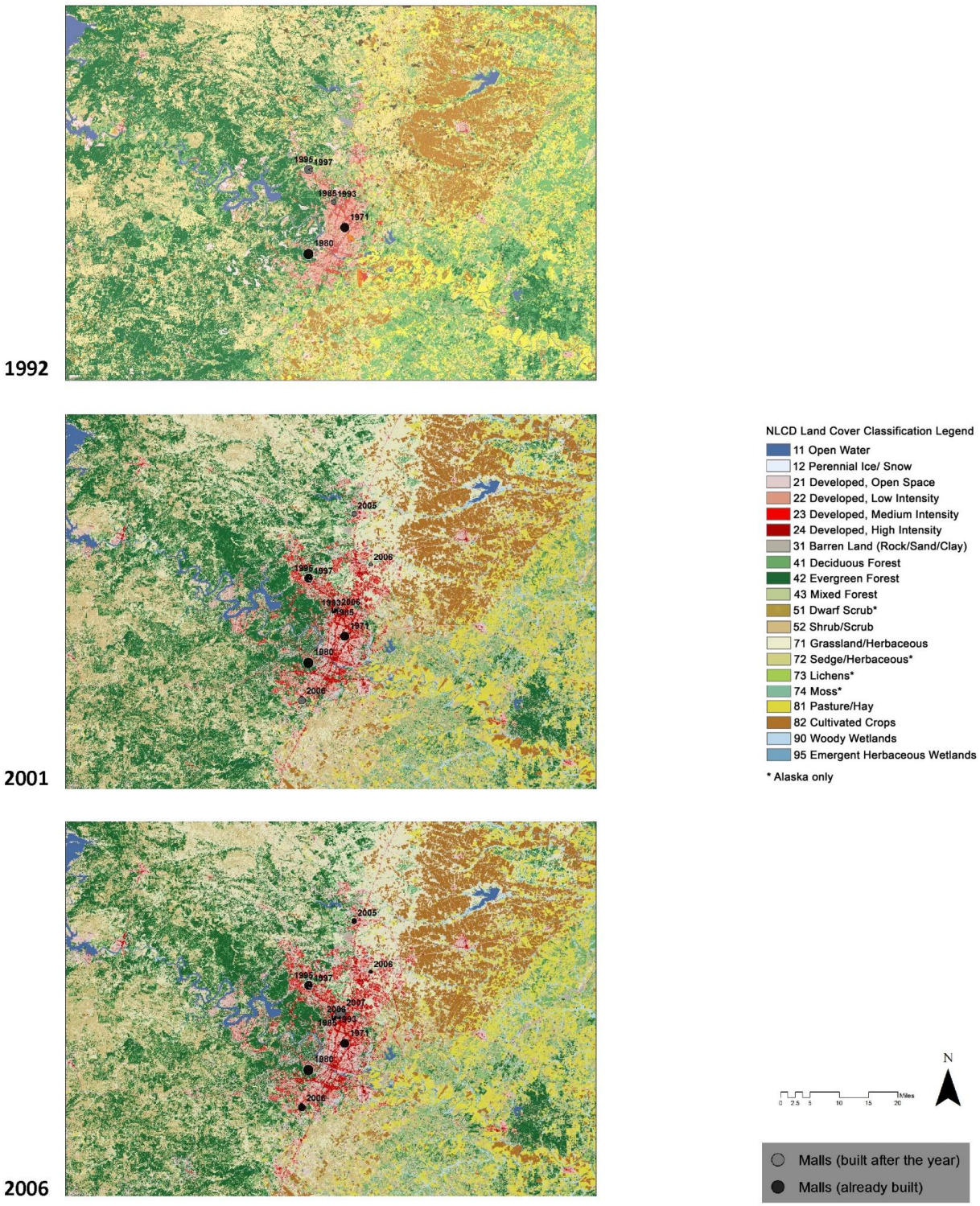

Figure 13. Austin land availability map

4.2.3. Population density

4.2.3.1. Dallas-Fort Worth

In the 1970, the population density in the area around the center was higher than the suburbs. In the early 1970s, three malls on the northern outskirts of Dallas and one mall at the northeast side of Fort Worth were constructed and began operation. At that time, malls tend to locate at the denser zones around the outskirts of the cities. However, at the downtown districts which showed highest density, we did not have any malls. With this finding, we can assume that malls followed the population concentration to a certain extent, but they tend to avoid the inner or central part of cities.

In 1980s, the already built malls started to become the center of the comparably denser areas. That is, the population densities tend to be increased in the areas around the malls. This is demonstrated by all seven malls built in the 1970s in DFW area. Meanwhile, new malls of the 1980s opened in the places which had higher density at that time. For example, the Collin Creek Mall began operation in Plano, the developing suburb of Dallas in 1981, and the Parks at Arlington was open at the southern side of the dense Arlington area in 1988.

On the map of the 1990, we can also reconfirm that the population densities around malls were comparably higher than others. For instance, most of the malls at the past-outskirts of each big city in DFW areas are surrounded with concentrated populations. In addition, two new malls were built in 2000 on the north side of Dallas, probably following to the population density increase of that area. Meanwhile, a small

new mall was built around the central Fort Worth, and it can be an exception that malls can avoid downtown locations.

In the 2000s and 2010s, the tendency that population densities around malls are higher is not as clear as before, especially in the past outskirt areas. One possible reason is that the variations of population density at the outskirts of DFW became more homogenized. Another reason can be the expansive increase of population density in every outward direction in DFW areas. In the similar context, it is important to note that the Grapevine Mills was open in 2007 in a very low density area.

4.2.3.2. Houston

In 1970, Houston was a mono-centric city in terms of the population density. That is, the population was clustered in the central area, and was diminishing toward the outskirts of the city. At that time, we had two malls, both of which located between the center and the outer circle of the city. The two areas around malls showed a medium level of population density. Based on this finding, we can say that malls in Houston at that time did not follow the population density as much.

In the year of 1980, also, population density was not the decisive factor for mall locations. For instance, the location of the new mall in the southeast suburb of Houston does not show us the preference of high density. In addition, the three new malls in the 1980s were all at the outskirts of Houston but their relationships with higher levels of

density were not apparent. Nonetheless, we can still recognize that new malls' locations were in the context of the expanding population growth to the outward of Houston.

In 1990s, new malls followed the population density to some extent, but not always. All the four new malls were located in the areas which experienced some increases of population density during the 1990s. However, there are some other places with higher density without new malls. For instance, the southeast part of Houston does not have malls within 15-mile distances, though with very high population density. This finding can tell us that population density is an important but not a decisive factor for mall location.

In the 2000s, the location of the new malls is even less related with the high population density. For example, the Houston Premium Outlets, and the Pearland Town Center seem to be located with no such relationship with population in the map of the 2000. Although in the 2010 map, the nearby population densities were increased, these places are not dense areas yet. To summarize, we can conclude that at least in the Houston area, higher population density and the location of malls are not correlated as much.

4.2.3.3. San Antonio

In the beginning of 1970s, the population of San Antonio was concentrated around the downtown area, showing a gradual density increase toward the center. The two malls were at the outskirts of the city, but to some extent, showed a preference on

higher density. Especially the South Park Mall, built in 1968, had a pretty close proximity to the high density central city.

During the 1980s and 90s, the expansion of population to the north was a major trend in San Antonio, and this was generally reflected to the location of new malls. For instance, the Ingram Park Mall can be associated with the density increase in the northwest part of the city. The two other new malls followed this trend, too, with their locations to the northeast part of outer circle which became pretty dense sectors around the year 1990. Meanwhile, in 1990 and 93, two outlet malls were developed in a clustered form at the San Marcos area with probably no relation with population density.

In the 2000s, the population expansion changed its direction a little, more toward the northwest side than northeast side. The location of the two new malls can be seen as a reflection of this trend. Although both were not sited at the hearts of dense area, they have close proximity to dense areas. To summarize, in San Antonio, malls tend to locate in preference with the growing sectors in terms of the population. However, it is also pretty clear that the recent population density within the city is rather homogenous compared to the past, and therefore density may not be the precise indicator of mall location.

4.2.3.4. Austin

Compared to other metropolitan areas in Texas, the distribution of population density in Austin is unique with the concentration to the central area, until now. In 1970s

map, the only mall was not located in the highest density area. However, as the city was small at that time, the mall was accessible from the dense downtown area, with only about 4 miles of distance. In the 1980s, a new mall was built in the southern part of the city, which was experiencing population growth, and was part of the city's north-southward expansion.

In the 1990s, the north and south expansion of population continued, and malls' location had some relationships with it. For instance, the areas around existing malls became denser than before. In addition, new malls were built in cluster in the northern part of the city, with a slight preference of higher density.

During the 2000s, new malls were sited with a reference to the population density, but in different patterns. For example, three new malls along the IH line seem to be located independently but adjacent to higher population density. On the other hand, a cluster of two other new malls is located nearby existing malls area, but all they could benefit from surrounding dense populations.

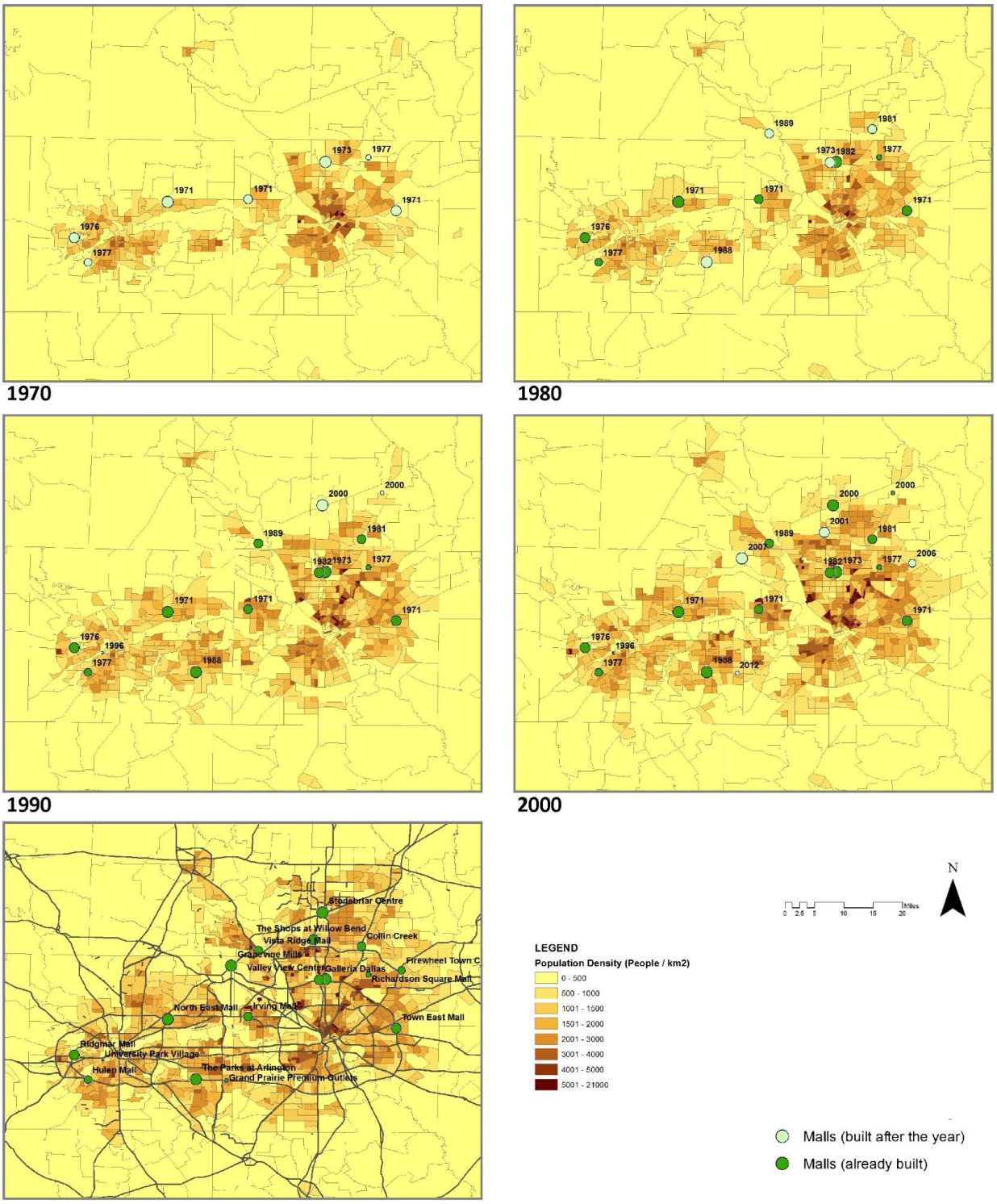

Figure 14. Dallas-Fort Worth population density map

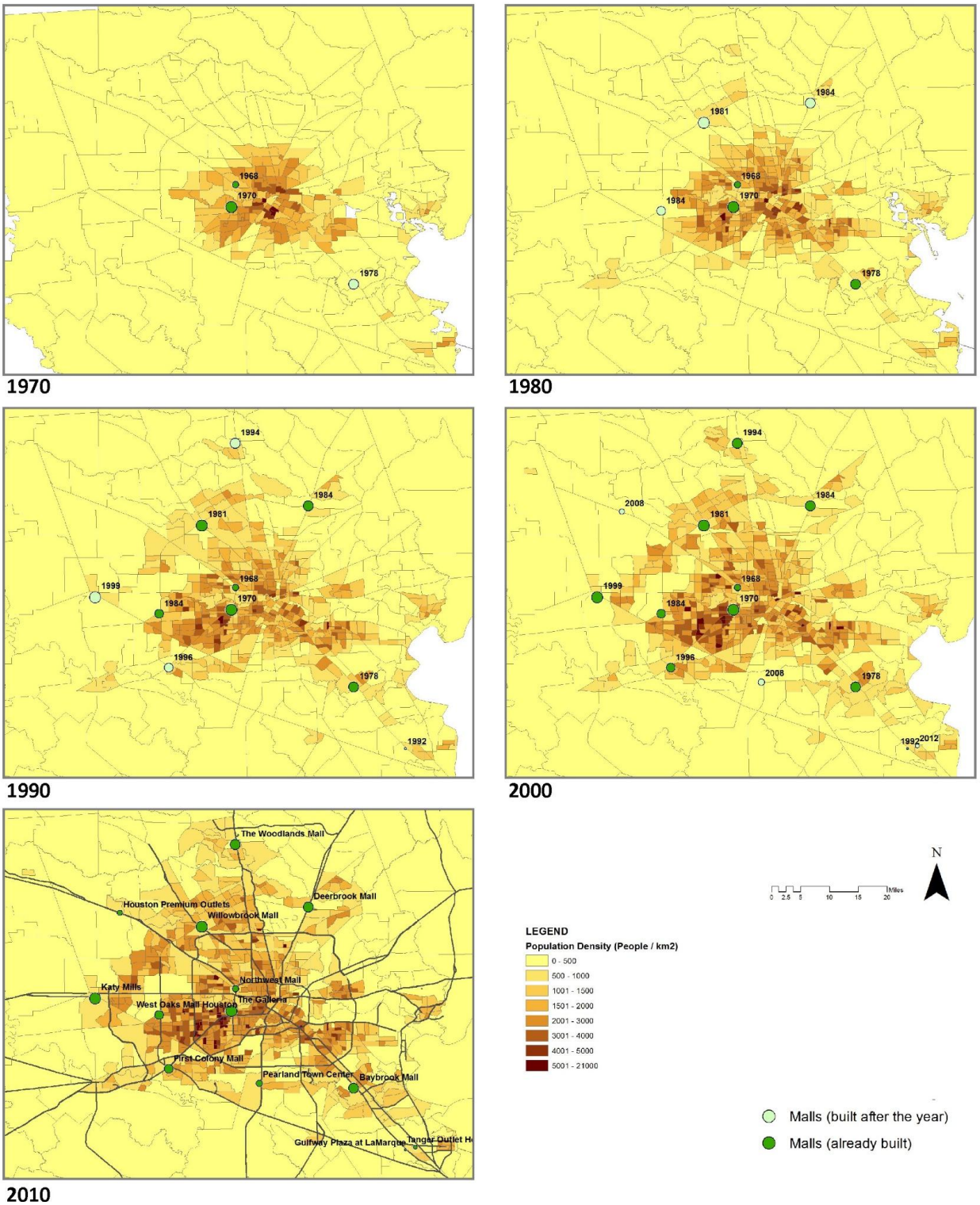

Figure 15. Houston population density map

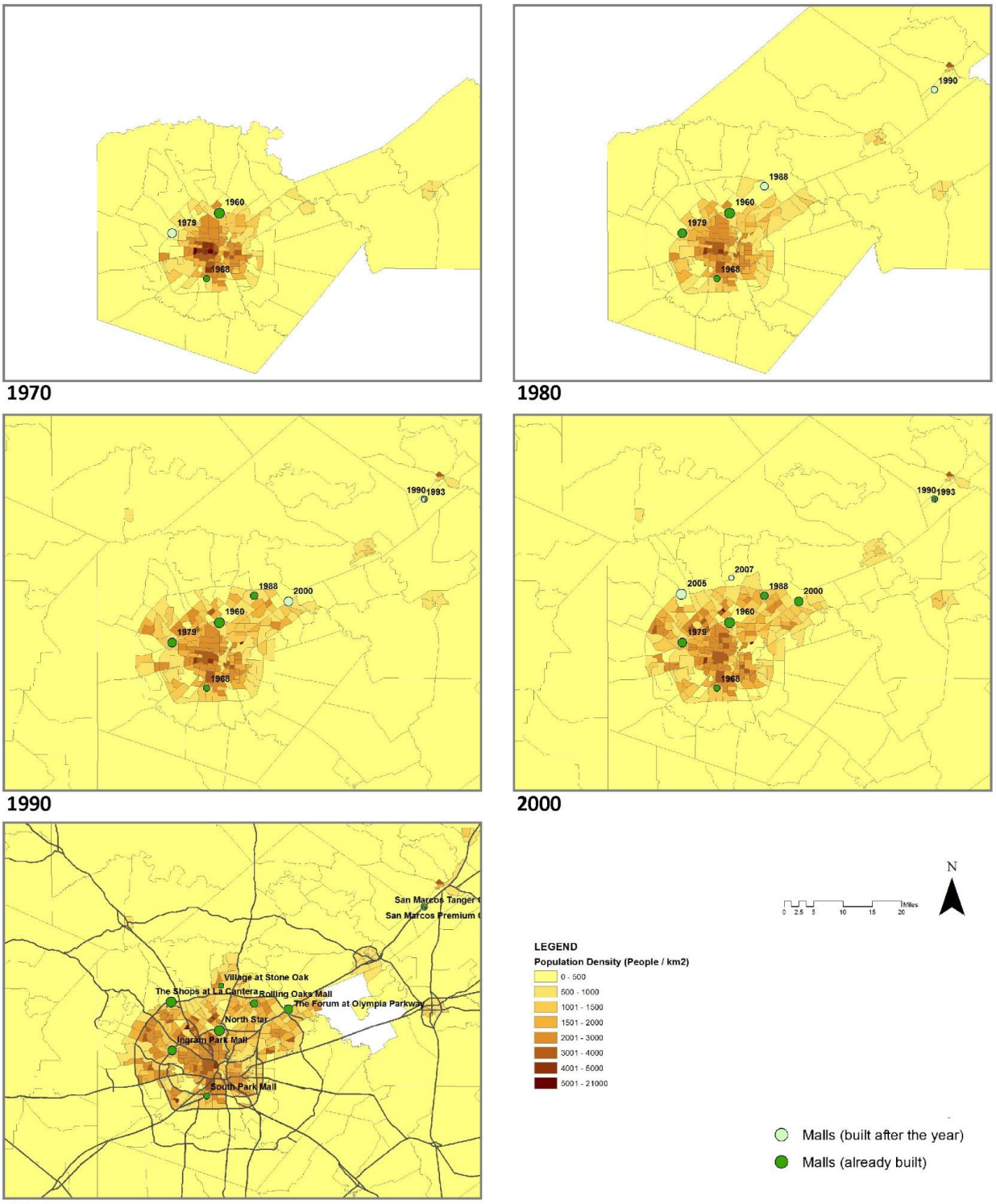

Figure 16. San Antonio population density map

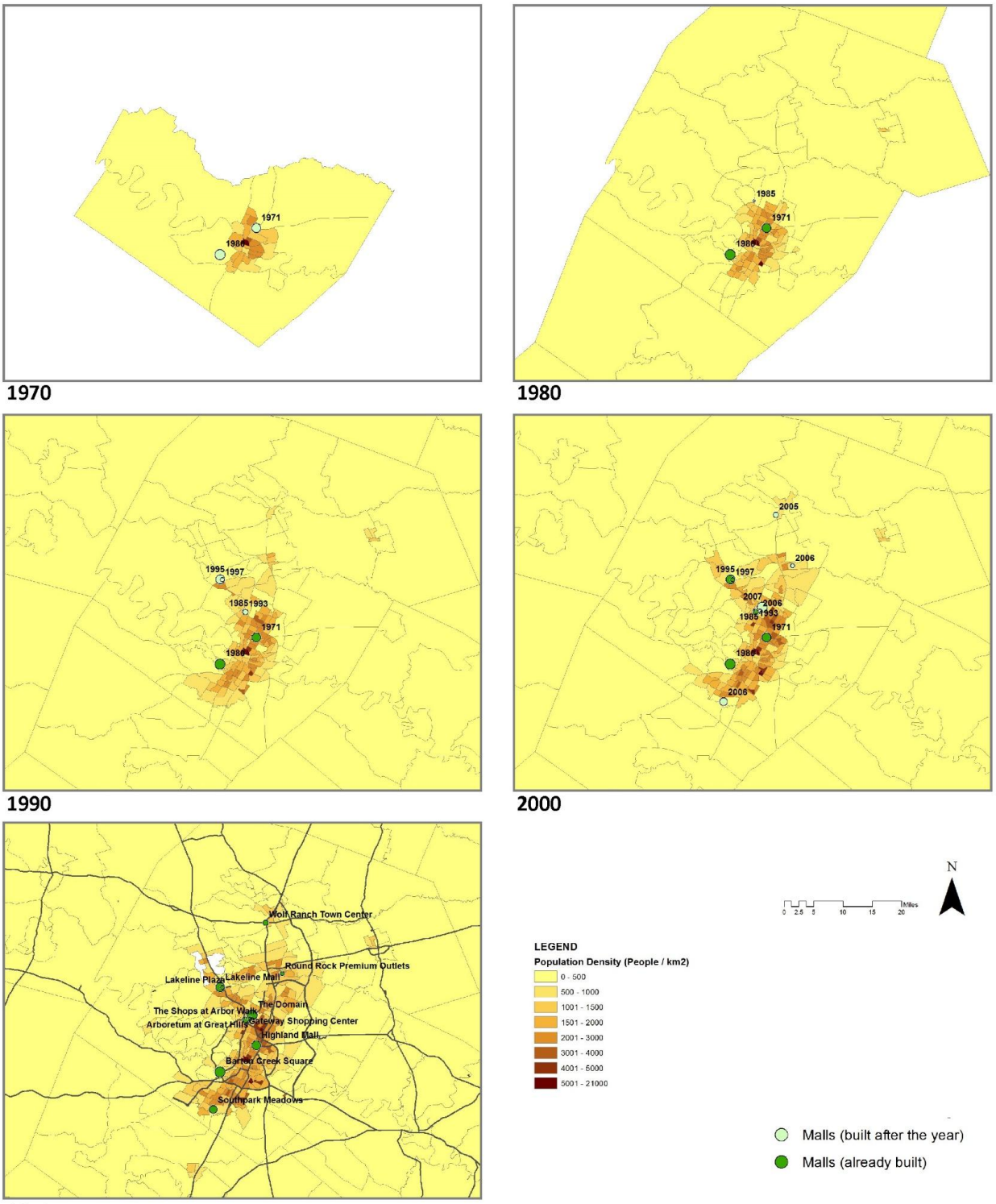

Figure 17. Austin population density map

4.2.4. Household income

4.2.4.1. Dallas-Fort Worth

In the 1970 map, we can clearly distinguish where the wealthy and the impoverished are living. The wealthiest were living in the north side of Dallas and the western part of Fort Worth, while the low income households were in the linear sectors from northwest to southeast in both Dallas and Fort Worth. During the 1970s three new malls opened in clearly high-income areas, but four others were not. We may guess the reason of this different location pattern can be the higher population density within these areas as discussed in the previous section.

In the 1980s, the surrounding areas around malls tend to show comparably high income level, although not all are apparent. The new malls built during the 1980s were usually located in areas above the moderate income level, but one interesting thing is that they had some impoverished zones within their market areas, which mostly became better in the 1990 map. Meanwhile, it is meaningful to mention that we do not have any mall at the low income sectors in DFW.

When we see the map of 1990, we can figure out the movement of wealth toward the northern part of the metropolitan area, especially over the Plano, a north suburb of Dallas. This trend is reflected in the two new malls built after 1999, which are all located in such sectors. A new small mall built in the central Fort Worth can also be influenced by the increasing income level of the area.

During the year of 2000 to 2010, we can see a huge shift of wealth to the north following the trend of the 1990s, and corresponding locations of new malls in the north

side. The Shops at Willow Bend, Grapevine Mills and Firewheel Town Center are all supporting examples. However, the upward movement of wealth is still under processing as shown in the map of 2010, and therefore we may experience a detachment of wealth and mall location. This is shown in two cases above, whose nearby areas are less wealthy compared to the 2000.

4.2.4.2. Houston

In 1970 Houston, the wealthiest people were living around the west side, with 3 to 7 mile distance from the central city, and at the northwest outskirts of the city. The impoverished population was in the downtown area and at the northeast part within the outskirts. The locations of two malls at that time properly followed the high household income area, with their close proximities to the west side of the city.

In the 1980s, the locations of new malls were reflecting the household income distribution pattern. For instance, the three new malls opened in 1981 and 1985 were all located close to the relatively high-income districts. In addition, the Baybrook Mall at the southeast suburb of Houston was also located with a close proximity to the comparably higher income areas. However, it is interesting to see that the adjacent southern part of this mall is a low income area.

On the 1990 map, the same rule is still working. The areas around malls show generally higher income level than other areas, and new malls tend to be located at the places where rich people are living. This is shown by the fact that most areas around

existing malls are in darker color, and that the Woodlands Mall and the First Colony Mall were planned to open at the high household income areas.

When it comes to the maps of the 2000s, we can find out two different tendencies. First, for the newly built malls, the rule to follow the high-income area still exists. The new malls including Katy Mills, Houston Premium Outlets, and Pearland Town Center are good examples with their close locations in high income areas. However, for some old malls like the Willowbrook Mall and the West Oaks Mall, the nearby areas are experiencing a little decrease in income level compared to the past. Based on this observation, we can think that while malls tend to prefer the high income area for location, they cannot forecast the future wealth of their market area.

Meanwhile, we can now answer to the question posed in the population part about the reason why malls are not built in the southeastern area which had a high population density. According to the household income map, we can see the area with poor income level. This will be probably a demerit for mall location.

4.2.4.3. San Antonio

In the 1970s, the wealthy people were living in the north side of San Antonio, while the downtown area and the south side are generally left for the impoverished. The first mall in the city was located in the rich sector, but interestingly, the second mall was built in the southern part which had rather low level of household income. This mall might be targeted to the larger population around downtown area even they were not rich.

During the 1980s and 1990s, the north-south division of the wealth remained similarly, but the wealthy sector became more dispersed. This trend can have relationships with mall locations to some extent. For instance, the Ingram Park Mall in the west of the city may be a reflection of the growth of household income in the west, and the two others can be the locations to the traditional high income districts in the northeast part.

In the 2000s, the wealthy sectors moved from the inner San Antonio to the north outside. The two new malls definitely followed this trend, with their locations at the northern part of the outer circle of the city. They could meet the demand for shopping of the new high income households in the north suburbs of San Antonio. The important point is that malls in San Antonio tend to locate exclusively in the north part of the city, and so, residents in the south of the city have limited access to malls even they now have better income level compared to the past.

4.2.4.4. Austin

It is a long history that the high income households in Austin are living in the west part of the city. However, as the 1970s map shows us, the only one mall at that time was located in a mid-income area, and close to the downtown. In the 1980s, new malls were built in the comparably west side of the city, probably following the higher income level areas.

During the 1990s, new malls are all built in the northwest part of the city. Although the site where new malls clustered are not the exact location of high income households, they were certainly within the market areas.

In the 2000s and 2010s, the new wealthy households are located in the northwest and southwest suburb of the city, and some new malls followed this wealth movement. For instance, the Wolf Ranch Town Center occupied the northward wealth, and the Southpark Meadows Mall presented shopping destination to the high income household in the southwest Austin. Meanwhile, two new malls are located in the existing mall cluster, with a pretty close proximity to wealthy districts in the west part. The reason of avoiding the wealthiest area can be the land availability problem of the west side, which has mountains covered with forests. In addition, the reason of no malls in the east part although it has a stronger highway network, can be the low household income level of the area.

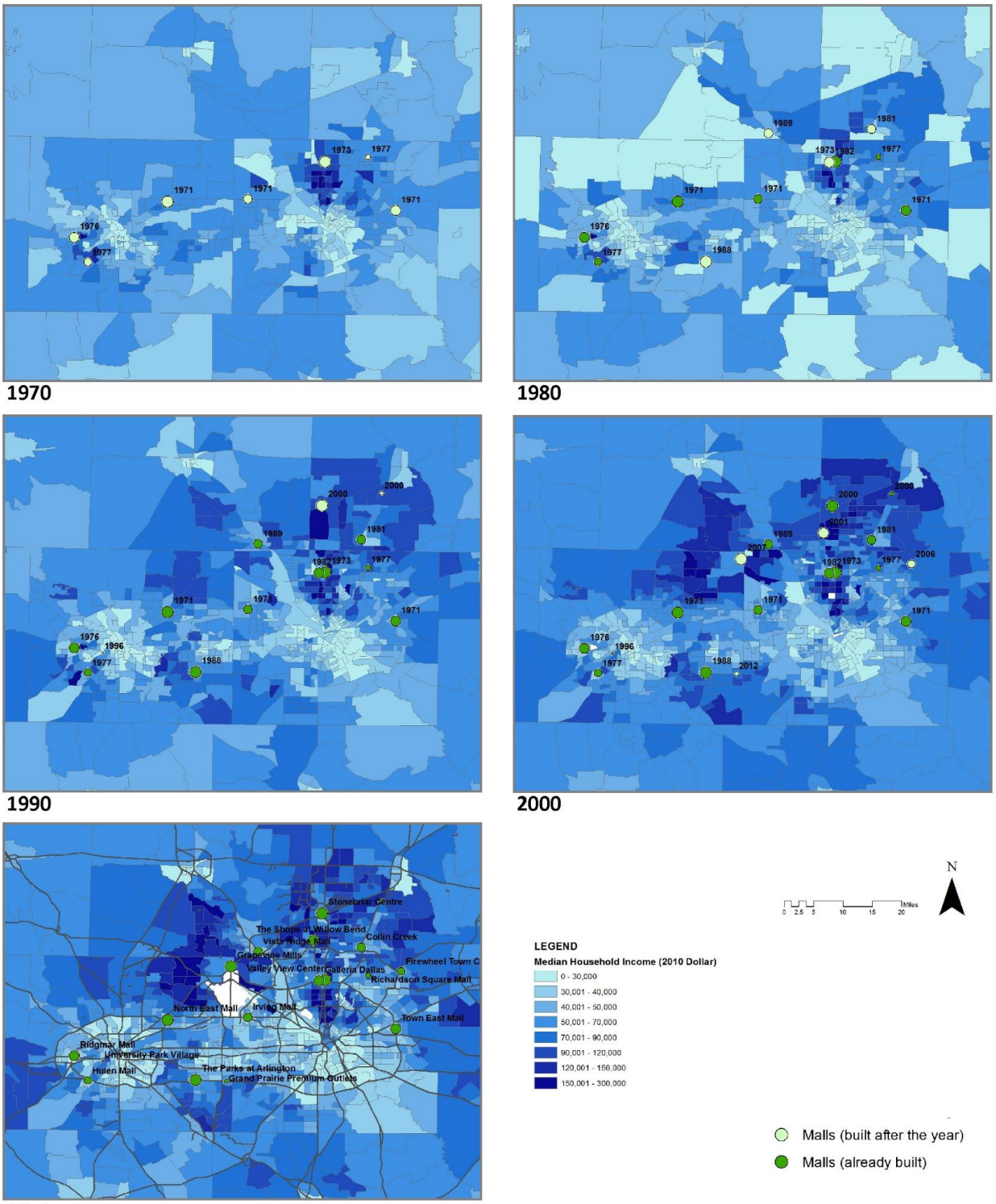

Figure 18. Dallas-Fort Worth household income map

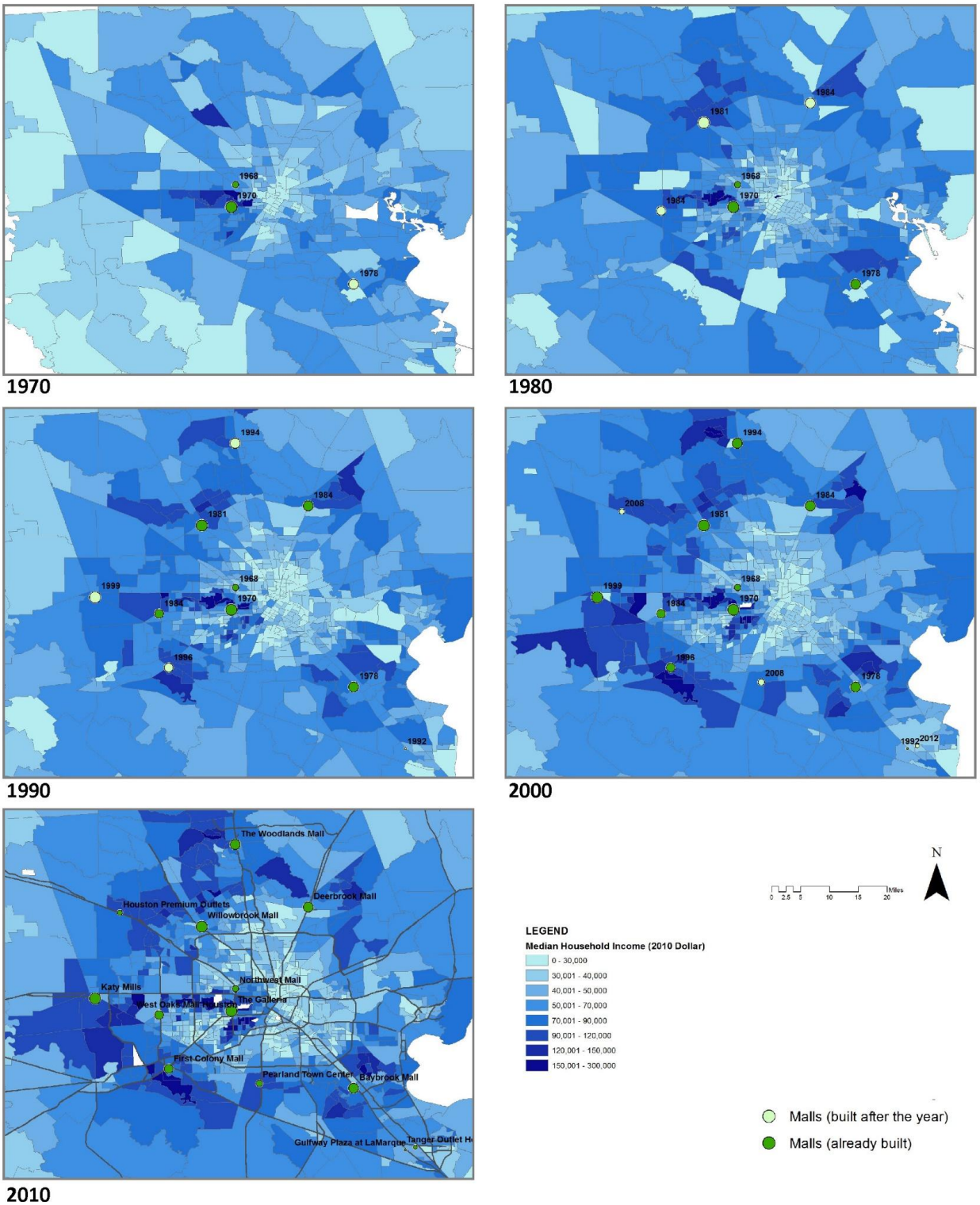

Figure 19. Houston household income map

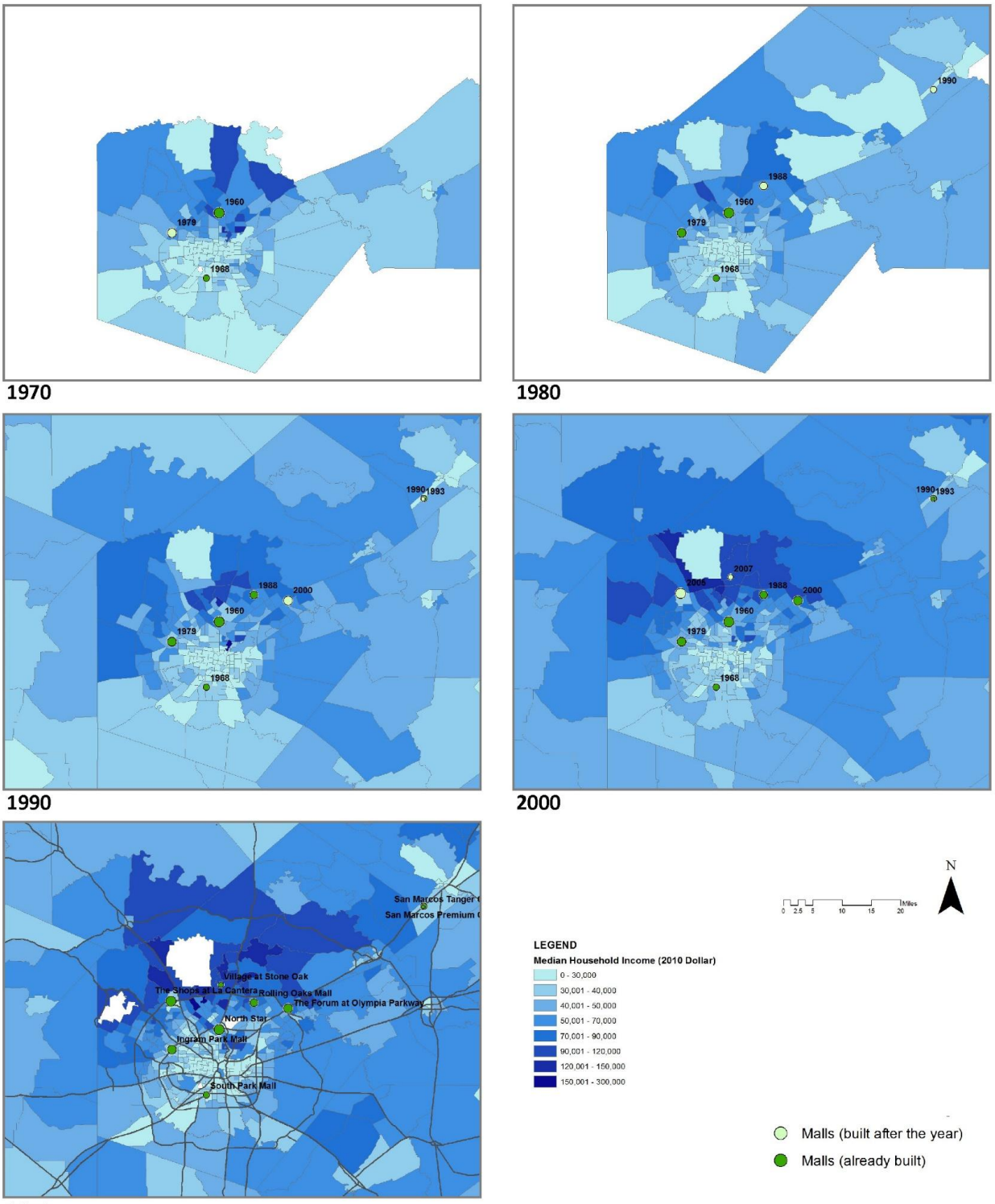

Figure 20. San Antonio household income map

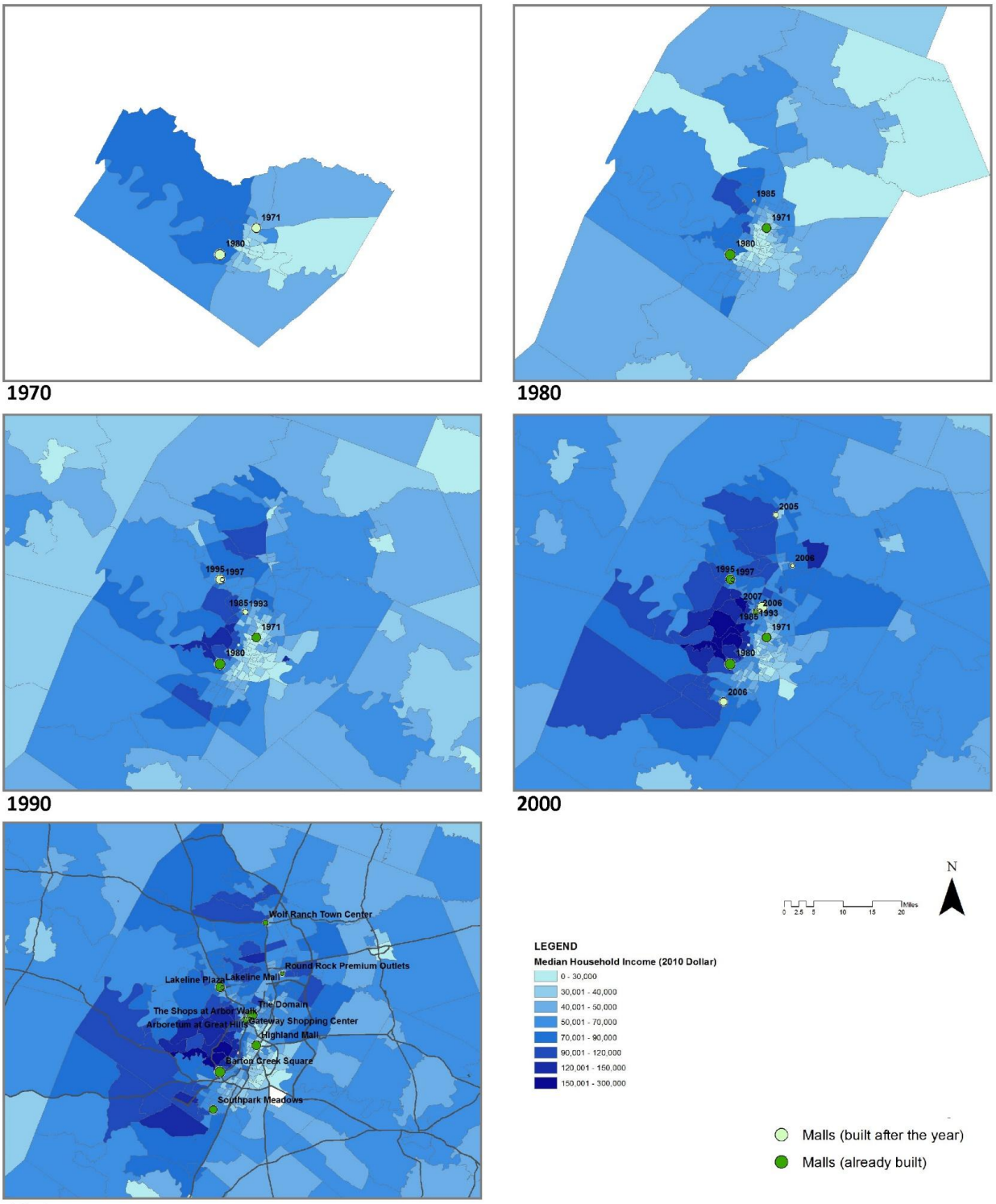

Figure 21. Austin household income map

CHAPTER V

CONCLUSIONS

In this study, we addressed the location patterns of malls in Texas and their possible associations with several conditions of the urban areas.

Overall, the location of malls showed pretty clear associations with the four factors we used for analyses. First, malls showed us a tendency to locate in places with close proximity to highway networks. Second, malls had a preference on places with more available lands for location decision. In addition, the higher population density areas tended to have more mall locations. Finally, malls preferred places where people with higher household income were living.

While all the factors had some extent of influences on mall locations, we could see some patterns of priorities among them. Above all, the existence of highway networks or nodes was probably the most decisive factor for mall's location decision. Compared to the land availability, this is apparent because within the similar land development condition, malls showed a clear tendency to locate to places which have better highway networks. Meanwhile, although population density and household income are both important factors for location, the income level had priority over the density, as most downtown cases showed us.

For the urban planners this study can present an important implication. According to the analyses, we have several districts which do not have malls despite of their high level of population density. It is because, as our analyses showed us,

household income level was a more important factor for a mall location than population density in general, and as a result, some high density areas had no malls due to low income level. This is an important problem, knowing that malls nowadays are not just places for consumption, but serve as leisure spaces for the community to some extent.

It is certain that the main function and purpose of malls is consumption, and that many of the cultural activities and events in malls are provided for the purpose of attracting more customers and promoting further consumption. However, we should not dismiss that, in reality, people enjoy spending time there with their families on the weekend, hanging around walkable corridors with street furniture and ice-cream parlor in malls. In this context, urban planners should think about how to address the problem of ‘mall desert’, which are urban sectors with many people but no malls, as a problem of equality of opportunity.

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APPENDIX

List of 81 malls in Texas

NAME	CITY	ZIP	Opening year	GLA (sqft)	Total retail	Vacancy rate	Store *	Restaurant	Anchor store	Outlets	OPERATOR
Allen Premium Outlets	Allen	75013	2000	442,000	104	1.89	100	4	0	O	Simon Premium Outlets
Stonebriar Centre	Frisco	75034	2000	1,600,000	182	0.55	159	23	6		General Growth Properties, Inc
Firewheel Town Center	Garland	75040	2006	950,000	116	9.38	104	12	2		Simon Malls
Grand Prairie Premium Outlets	Grand Prairie	75052	2012	417,000	111	0.00	103	8	0	O	Simon Premium Outlets
Irving Mall	Irving	75062	1971	1,053,000	107	11.57	93	14	5		Simon Malls
Vista Ridge Mall	Lewisville	75067	1989	1,063,407	126	18.71	117	9	4		Rouse Properties
Collin Creek	Plano	75075	1981	1,117,714	126	12.50	113	13	5		Rouse Properties
Richardson Square Mall	Richardson	75081	1977	517,000	8	0.00	6	2	0		Simon Malls
Midway Mall	Sherman	75090	1986	606,494	29		28	1	3		David Pinter
The Shops at Willow Bend	Plano	75093	2001	1,261,000	150		135	15	3		Taubman Centers
Town East Mall	Mesquite	75150	1971	1,250,000	134	0.74	113	21	4		General Growth Properties, Inc
Tanger Outlet	Terrell	75160	1994	177,800	38	5.00	36	2	0	O	Tanger Factory Outlet Centers, Inc
Galleria Dallas	Dallas	75240	1982	1,425,000	170		136	34	2		Simon
Valley View Center	Dallas	75240	1973	1,633,285	121		106	15	2		Jones Lang LaSalle
Central Mall Texarkana	Texarkana	75503	1978	685,868	81	11.96	73	8	5		Jones Lang LaSalle
Longview Mall	Longview	75605	1978	639,000	87	5.43	80	7	4		Simon Malls
Broadway Square	Tyler	75703	1975	628,000	80	0.00	75	5	3		Simon Malls
The Parks at Arlington	Arlington	76015	1988	1,528,000	166	2.92	147	19	5		General Growth Properties, Inc
Grapevine Mills	Grapevine	76051	2007	1,777,000	207	5.48	178	29	7	O	Mills Corp/Simon Malls
North East Mall	Hurst	76053	1971	1,670,000	166	4.05	145	21	7		Simon Malls
University Park Village	Fort Worth	76107	1996	173,220	35		29	4	0		Glimcher Realty Trust
Ridgmar Mall	Fort Worth	76116	1976	1,273,000	114	17.39	100	14	6		Macerich
Hulen Mall	Fort Worth	76132	1977	942,000	122	3.17	106	16	3		General Growth Properties, Inc
Sikes Senter	Wichita Falls	76308	1974	670,000	79	4.82	71	8	5		Rouse Properties
Killeen Mall	Killeen	76543	1981	557,418	116	15.33	106	10	4		Jones Lang LaSalle
Outlets at Hillsboro	Hillsboro	76645	1989	359,954	33		33	0	0	O	Craig Realty Group
Richland Mall	Waco	76710	1980	708,249	92	5.15	79	13	5		CBL & Associates Properties, Inc
Sunset Mall	San Angelo	76904	1979	559,864	92	20.00	87	5	6		Jones Lang LaSalle
The Galleria	Houston	77056	1970	2,237,000	295	6.05	262	33	7		Simon Malls
Willowbrook Mall	Houston	77070	1981	1,520,000	135	5.59	119	16	5		General Growth Properties, Inc
West Oaks Mall Houston	Houston	77082	1984	1,047,124	88		77	11	3		perm/short lease different mngmt
Northwest Mall	Houston	77092	1968	794,092	56		50	6	1		Levcor, Inc
Outlets at Conroe	Conroe	77303	1992	281,415	24		24	0	0	O	Craig Realty Group
Deerbrook Mall	Humble	77338	1984	1,200,000	127	1.55	109	18	6		General Growth Properties, Inc
The Woodlands Mall	The Woodlands	77380	1994	1,355,000	179	1.10	156	23	5		General Growth Properties, Inc
Houston Premium Outlets	Cypress	77433	2008	541,000	149	0.67	138	11	0		Simon Premium Outlets
First Colony Mall	Sugar Land	77479	1996	1,125,000	139	2.80	118	21	4		General Growth Properties, Inc
Katy Mills	Katy	77494	1999	1,559,000	160	4.76	142	18	5	O	Mills Corp/Simon Malls
Baybrook Mall	Friendswood	77546	1978	1,294,000	160	0.00	139	21	5		General Growth Properties, Inc
Gulfway Plaza at LaMarque	La Marque	77568	1992	176,102	26		25	1	0	O	SugarOak Property
Pearland Town Center	Pearland	77584	2008	718,000	113	10.32	96	17	2		CBL & Associates Properties, Inc
Tanger Outlet Houston	Texas City	77591	2012	352,720	86	3.37	75	11	0	O	Tanger Factory Outlet Centers, Inc
Central Mall Port Arthur	Port Arthur	77642	1982	700,346	66	17.50	60	6	6		Jones Lang LaSalle
Parkdale Mall	Beaumont	77706	1973	1,203,776	153	7.83	132	21	5		CBL & Associates Properties, Inc
Post Oak Mall	College Station	77840	1982	775,000	104	11.86	94	10	6		CBL & Associates Properties, Inc
Victoria Mall	Victoria	77904	1981	678,996	64		56	8	6		Hull Storey Gibson
Mall del Norte	Laredo	78041	1977	1,163,183	146	7.01	124	22	8		CBL & Associates Properties, Inc
The Forum at Olympia Parkway	Selma	78154	2000	1,100,000	119		93	26	6		Avr Realty Co LLC
North Star	San Antonio	78216	1960	1,257,000	153	0.65	136	17	5		General Growth Properties, Inc
South Park Mall	San Antonio	78224	1968	789,720	114	4.20	103	11	4		Jones Lang LaSalle
Ingram Park Mall	San Antonio	78238	1979	1,125,000	170	2.86	155	15	7		Simon Malls
Rolling Oaks Mall	San Antonio	78247	1988	882,000	96	12.73	86	10	4		Simon Malls
The Shops at La Cantera	San Antonio	78256	2005	1,310,000	175	1.13	160	15	4		General Growth Properties, Inc
Village at Stone Oak	San Antonio	78258	2007	598,350	72	22.58	63	9	1		DDR Corp

Palms Crossing	McAllen	78501	2007	392,000	35	7.89	24	11	0		Simon Malls
La Plaza Mall	McAllen	78503	1976	1,222,000	138	1.43	119	19	5		Simon Malls
Sunrise Mall	Brownsville	78526	1979	752,853	120	6.25	106	14	4		CBL & Associates Properties, Inc
Valle Vista Mall	Harlingen	78552	1983	656,000	68	20.00	59	9	5		Simon Malls
Rio Grande Valley Premium Outlets	Mercedes	78570	2006	604,000	134	4.29	126	8	0	O	Simon Premium Outlets
Lakeline Mall	Cedar Park	78613	1995	1,098,000	162	4.14	144	18	5		Simon Malls
Lakeline Plaza	Cedar Park	78613	1997	387,000	30	0.00	26	4	0		Simon Malls
Wolf Ranch Town Center	Georgetown	78627	2005	626,000	78	1.27	62	16	3		Simon Malls
Round Rock Premium Outlets	Round Rock	78664	2006	430,000	127	1.55	118	9	0	O	Simon Premium Outlets
San Marcos Premium Outlets	San Marcos	78666	1990	737,000	143	4.03	133	10	0	O	Simon Premium Outlets
San Marcos Tanger Outlets	San Marcos	78666	1993	441,929	107	0.00	98	9	0	O	Tanger Factory Outlet Centers, Inc
Barton Creek Square	Austin	78746	1980	1,430,000	167	0.00	149	18	6		Simon Malls
Southpark Meadows	Austin	78748	2006	921,141	128	7.91	99	29	3		Retail Properties of America, Inc
Highland Mall	Austin	78752	1971	1,111,207	55	54.92	52	3	0		Jones Lang LaSalle
The Domain	Austin	78758	2007	1,214,000	128	1.54	112	16	3		Simon Malls
Arboretum at Great Hills	Austin	78759	1985	198,000	35	14.63	29	6	0		Simon Malls
Gateway Shopping Center	Austin	78759	1993	512,000	35	10.26	32	3	1		Simon Malls
The Shops at Arbor Walk	Austin	78759	2006	458,000	34	5.56	24	10	0		Simon Malls
Plaza Del Sol	Del Rio	78840	1979	260,538	44	4.35	39	5	4		Levcor, Inc.
Mall de las Aguilas	Eagle Pass	78852	1982	446,667	64	20.99	55	9	4		Jones Lang LaSalle
Westgate Mall Amarillo	Amarillo	79121	1982	877,721	106	7.83	94	12	5		Jones Lang LaSalle
South Plains Mall	Lubbock	79414	1972	1,131,000	135	12.34	125	10	5		Macerich
Mall of Abilene	Abilene	79606	1979	680,447	93	16.22	87	6	4		Jones Lang LaSalle
Midland Park Mall	Midland	79705	1980	618,000	85	3.41	76	9	4		Simon Malls
The Outlet Shoppes at El Paso	El Paso	79835	2007	378,354	89		83	6	0	O	Horizon Properties Group
Sunland Park Mall	El Paso	79912	1988	922,000	98	6.67	84	14	5		Simon Malls
Cielo Vista	El Paso	79925	1974	1,242,000	143	2.72	126	17	5		Simon Malls

* Stores including anchor stores